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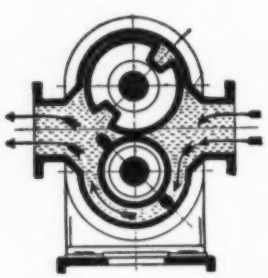

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FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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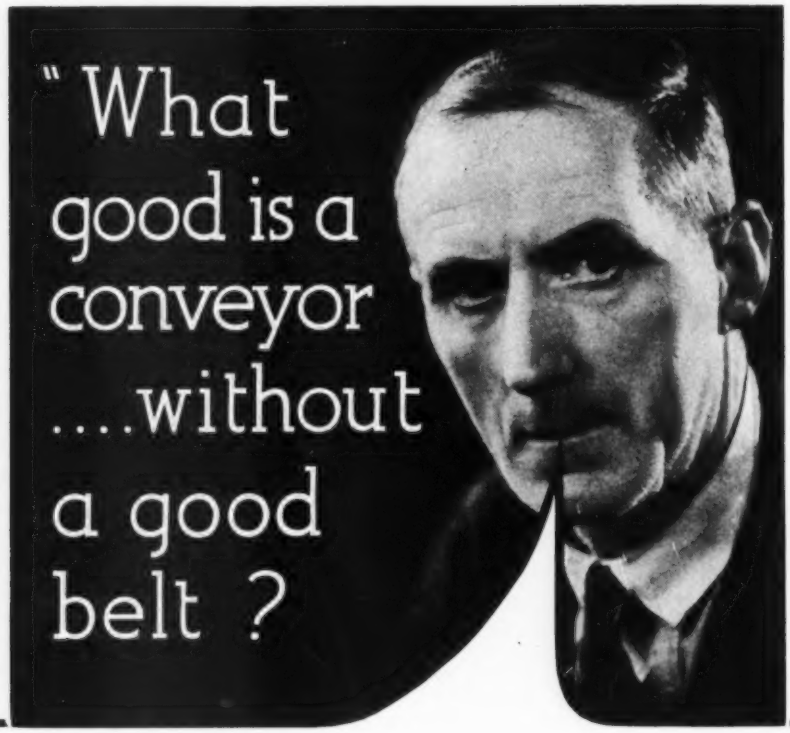
MANAGING EDITOR: G. W. Lacey, B.Sc., A.I.C.



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FOOD MANUFACTURE

Vol. XI, No. 5 May, 1936

Food and War

THERE HAS been a veritable spate of references to this subject in the House of Commons and in the Daily Press during the past month. As usual, the Government has given an assurance that the subject has not been overlooked and will be examined. Some emphasis has been placed by the Government spokesmen in both Houses on evidence that, since the National Government came into office, the amount of food produced in this country has been increased by more than 14 per cent. In fact, the tendency is to over-stress the possibility of increasing home production and not to give sufficient attention to the much more vital necessity for the storage of reserves of food supplies. Apart from Mr. Fairbrother's article published last month, and the comments in these columns, hardly any mention has been made of the storage of foods such as canned meats, dairy produce, fruit and vegetables, sugar, preserves, etc., which, though not quite so staple as wheat and flour, are essential to the maintenance of a proper standard of life. It is obvious that to sustain a war of attrition every one must be kept in as fit a condition as possible, and not just above the starvation level as a result of which epidemic diseases such as influenza can literally decimate the population. As we have said, and repeat, the resistance and therefore the defence of this nation is as dependent upon adequate supplies of foodstuffs of full nutritive value as it is upon its defence forces, if not more so. For it has been said in recent years by students of war in more than one continental country that there is only one form of attack upon this country that is likely to achieve success, and that is to starve us.

As indicated by Mr. G. R. Harding, Managing Director of Maconochie Bros., Ltd., in a letter published on page 176, the London Chamber of Commerce, at a meeting on April 8, carried unanimously a motion substantially supporting the provision of an adequate supply of foodstuffs in case of war. Mr. A. LL. Matthison, President of the National Food Canning Council, also stated, in a letter published on the same page, that he considers Mr. Fairbrother's article most timely and appropriate, and he draws attention to the fact that armaments become obsolete and have to be replaced at continual expense, whereas a stock of canned foods would not deteriorate and would not incur further expenditure. Indeed, it would always be an asset.

The Times of April 14 acknowledged the special contribution of FOOD MANUFACTURE to this subject, referring to Mr. Fairbrother's "outstanding article on this country's food reserves in the event of war". We have no doubt, also, that, in the many references to the subject that have been made recently, this contribution has been a source of inspiration. It seems that for the present the new Minister of Defence is to take the problem of food supplies in the event of war under his wing, which we consider to be quite an impossible task. Associated with the co-ordination of physical defence forces, it is certain to be regarded as of least importance. The storage capacity for wheat has been estimated by the Board of Trade at 1,500,000 tons, or ten weeks' supply, but less than a seventh of this is filled at present. The stock of wheat and flour in the granaries and in the hands of the millers and bakers has been stated by Sir Thomas Inskip, at a meeting of the Parliamentary Agricultural Committee, to be sufficient to last three months. This would be a totally insufficient reserve for a war with modern mechanism. The principal storage facilities are located at a few ports in this country, and are all landmarks at which air forces would strike immediately on the outbreak of war. The storage facilities must be considered as a complete scheme from an entirely new point of view governed by the conditions of warfare of to-day. There must be storage facilities specifically designed for grain, sugar, canned goods, etc., and they must be spread throughout the country at the least vulnerable points, built underground in such a way as to resist destruction by air attack or contamination by poisonous gases.

As to cold storage facilities for perishable or unpreserved foods, these appear to be more adequate

in capacity than the grain stores, though here again only 30 per cent. of the accommodation is actually in use. Mr. William Bishop, Chairman of the National Cold Storage Company, who referred recently to the use of cold storage in a national emergency, said that there are more than 250 cold stores throughout the country. These are much more widely distributed than the granaries. A significant fact which Mr. Bishop also mentioned is that during the last war not more than a fraction of the available cold storage accommodation was utilised. This was, of course, due to the fact that the supplies were so reduced that the quantity to be held in store was dangerously near the limit of extinction, as everyone now knows. Nevertheless, cold storage arrangements must be taken into consideration in working out a complete scheme for the storage of reserves as an important part of the co-ordination of food supplies. That this co-ordination is imperative and urgent is undoubtedly borne out by the tremendous amount of attention the subject has excited. The Government must be made to realise the absolute necessity of instituting the machinery of co-ordination by continual reference to it. We do not fulfil a political function, but we have made what we think will prove to be a valuable contribution by stimulating the interest of food manufacturers and of many people throughout the country concerned in the welfare of the nation.

Food from Wood

Whilst on this subject of food supplies and defence, we must not lose sight of the work of the German chemists to which Professor Bergius, as their leader in this field, referred at an International Conference on timber utilisation and research in London only a week or so ago. "Scientific self-sufficiency" is one of the aims of the Nazi régime, and this includes "synthetic" foodstuffs, though not yet of the concentrated type to be taken in tablet form envisaged by some utopian imaginaries. The stomach of the most highly developed, scientifically minded human being will never be satisfied with a reduction of the bulk of material food to absurdity. And since the digestive organs function most effectively in response to the gratifying sensations of taste and smell, palatability will always be an essential attribute of all foods. Anyway, wood is now being broken down into its chemical constituents, from which wood sugar has been derived. The production of proteins and glycerine was also mentioned by Professor Bergius, who stated that the yield of wood sugar from a poor quality wood was as high as two-thirds. He did not, however, mention the cost of production, which presumably waits upon commercial scale experiments. Though Professor Bergius alluded to the feeding of human beings as well as animals, the significant value of wood sugar and any derivatives is its use in conjunction with other essential foods in the fattening of animals for human consumption. Now we shall have to grow more trees!

This Nutrition Question

The subject of nutrition has been well ventilated of late; in fact, in a recent paper to the *Lancet*, Dr. Hutchison, a consulting physician to the London Hospital, has described it as "the public health stunt of the moment". It certainly has received a good deal of attention, and a number of committees have been at work on various aspects of the problem. Three separate committees—appointed by the Ministry of Health, the B.M.A., and the League of Nations respectively—have been struggling with the relatively simple problem of man's energy requirements. Incidentally, each of these committees has recommended a different calorie value as being needed to maintain efficiency! Dr. Hutchison states that he wrote his paper as a protest, firstly, against "the pessimistic view apparently so commonly held, that defective nutrition is widely prevalent in this country and, secondly, against the undue optimism which believes that a great improvement in the public health can be brought about by altering the national diet". The writer deplores the fact that nutrition is a subject "which has got badly mixed up with politics, with the consequence that much of the writing about it in the lay, and even in the medical, Press is of a tendentious character". We agree that the relation of nutrition to health is a complicated matter and one which requires cool and clear thinking. We do not feel, however, that any harm is being done by the investigations of the various committees on the subject, and we believe that ultimately the problem is bound to be a political matter.

A Controversy

It was quite evident that Dr. Hutchison's outspoken views would not be allowed to pass unchallenged. Very quickly Dr. Neustatter replied to the contention that practitioners in touch with the poorer classes would deny the existence of widespread malnutrition by a direct negative as follows: "An enormous number of working-class children are in an unsatisfactory condition com-

pared to those of the well-to-do classes, and their condition is due to factors associated with poverty". Following this, Dr. Hutchison has been accused of contradicting himself "when he first ascribes lowered resistance to tuberculosis to a deficiency of fat in the diet and later maintains that there is no proof that dairy products protect us against any of the great killing diseases". Dr. Spence's report on malnutrition in Newcastle shows that a considerable proportion of families cannot afford, and actually do not get, diets up to the standard of the British Medical Association Committee's minimum. These views have led to a first-rate controversy in which well-known members of the medical profession are using up columns of the *Lancet* in contradicting each other. Some say that poverty is associated with under-weight, under-height, pallor and prematurely senile appearance. Another says, "I have examined many thousands of children in similar districts of London and have not found any considerable number with this unsuitable physique". If the whole matter were not so tragic it would be humorous. The fact remains that there is considerable disagreement among doctors about this nutrition problem, and we would recommend to everybody the careful study of such publications as Sir John Orr's *Food, Health and Income* and Sir Robert McCarrison's Cantor Lectures to the Royal Society of Arts to which we have already referred in some detail in these columns. These, in our view, entirely challenge Dr. Hutchison's protests and indicate that there is much defective nutrition and that something ought to be done about it at once.

Pasteurising Plants

We have frequently referred to the problems of pasteurisation of milk, and have discussed the apparent failure of pasteurisation of milk between 145° and 150° F. for 30 minutes to destroy tubercle bacilli. This problem was fully dealt with by No. 189 of the Medical Research Council's Special Report Series. As other workers have obtained consistently negative results when examining milk from efficiently designed and operated pasteurising plants under the same conditions of time and temperature, it would appear that failure to destroy the tubercle bacilli is an indication of a bad design or inexpert operation of the apparatus. In order to test this possibility Scott and Wright (Hannah Dairy Research Institute, 1935. *Bull.* No. 6, p. 72) have examined 19 plants in four Scottish cities. Various aspects of the problem were studied, including filtration, type of heating apparatus, holding tanks and cooling apparatus. In judging the suitability of milk received for pasteurisation, attention should be paid not only to the pre-pasteurisation bacterial count, as that is frequently an unfair index of the conditions under which the milk has been produced, but also to the post-pasteurisation count of heat resistant organisms. It is suggested that the dairy farms would do well to carry out routine bacterial examinations of milk after every stage of pasteurisation, for such a procedure would give a reliable check of the efficiency with which the apparatus was functioning. Irrespective of any other tests, the final adequacy of plants must be judged by their ability or otherwise to destroy tubercle bacilli, since that is the primary object of pasteurisation. Scott and Wright found that out of 332 samples of milk taken from three plants run in a slipshod manner 3·3 per cent. contained tubercle bacilli. Out of 340 samples taken from 4 efficiently operated plants, none was found to contain the organism. The moral seems obvious. An interesting contribution on the subject will be found on page 184.

A Sensible Judgment

We have on many occasions referred to the difficulties in the way of administering the Sale of Food (Weights and Measures) Act in relation to pre-packed articles that contain moisture and therefore are liable to loss in weight by evaporation. We have called attention to certain prosecutions instituted by Inspectors of Weights and Measures which have either failed to secure a conviction or, if successful in the first court, have been quashed on appeal. These proceedings—which we think are frequently unnecessary and often instituted owing to the inspector's incomplete knowledge of the article in question—make things very difficult for perfectly honest traders who are compelled to defend their honour in matters over which they have no control. Yet another has been added to the list of prosecutions for short weight in flour, and in this case the facts brought forth a rebuke from the magistrates to the Inspector of Weights and Measures. A grocer in Market Bosworth kept his bulk flour in a warehouse at the back of the shop. He weighed 7 bags in the warehouse and took them into his shop, which was evidently warmer and drier than the warehouse, and the inevitable evaporative loss occurred. This defence was successful, and the chairman, in dismissing the case, said that the bench considered that in such instances where the deficiency was slight and could be accounted for by such a reasonable explanation,

the Weights and Measures Department might well adopt the course of warning the offender to exercise greater care, instead of prosecuting. That is exactly what we have advocated from the beginning, and it is high time that inspectors acted more in accordance with this sensible principle.

Adulteration

It has become axiomatic that it is not possible for each individual to make or prepare with his own hands all the commodities necessary for his existence. No individual can ever be entirely self-supporting and must, therefore, leave the preparation of something or other to somebody else. The obvious result of this is continual suspicion about the quality and purity of anything that anybody else makes. The man in the street, as a result of generations of suspicion, is always ready to gulp greedily any grim story of adulteration or substitution, especially in regard to foodstuffs. Fully aware of this lamentable predisposition on the part of a vast majority of people, the sensational Press, with clockwork regularity, holds forth at great length and in gruesome terms about the terrible forms of adulteration practised by food manufacturers. As long ago as 1757 *Poison Detected* had on its title page, "If thy brother wants bread, wilt thou give him a stone?" One might have imagined that with man's gradual enlightenment as to the discoveries of science and medicine these tirades would have long since ceased. But, no, recently a well-known weekly journal, which specialises as a rule more on crosswords, doublets, limericks, and other such intellectual occupations than scientific dissertations, has hurled forth a fresh blood-curdler entitled "The Great Food Scandal". It is high time that the scaring of the public in this fashion ceased altogether.

The Whole Truth

When an article quotes actual figures one expects them to be correct, but apparently statistics are now liable to falsification. The article says, "The percentage of adulteration is steadily on the increase. It has, in fact, almost doubled during the past four years. In the 1931 report it was 2·7 per cent. of the samples taken, in 1934 (the last report issued) it was 5·3 per cent." We do not know where the 1931 figure was obtained, but according to our records the figure was 4·6 in 1931. This was the lowest on record. Sir George Newman (who ought to know) referred in 1933 to the remarkable improvement which had taken place during the last fifty years, the adulteration rate having gradually fallen from 20 per cent. to about 5 per cent. One of the pernicious features of the article is the publication of half truths, to quote one, "Last year the analysts found 73 samples adulterated or faked". This was in reference to butter, and the actual report states, "of 8,612 samples of butter examined 73 were found to be adulterated or not up to standard, 69 contained water in excess of the legal maximum of 16 per cent.—one contained boron preservative". This gives a very different picture—out of nearly 9,000 samples only one contained anything that might be injurious to health. There really ought to be a board of censors to investigate the validity of these articles, which are nothing but rank sensationalism and likely to create wrong impressions about our food industries. Food manufacture in this country is probably the most hygienic in the whole world, and the percentage of adulteration or substitution is negligible. In these matters let us have the Truth, the whole Truth and nothing but the Truth.

Soil Warming

In our Editorial Comments for January, 1935, we wrote a paragraph called "Central Heating for Orchards", and pointed out that the system of guarding against spring frosts by artificial heating so popular in America had been used successfully in Kent. There has been comparatively slight progress in Britain until recently, but since duties were levied on imported vegetables the advance has been more rapid. It should be remembered that the main advantage of bottom heating does not lie solely in quickening the growth of plants so that the user secures an early market — useful though this may be. Soil warming, whether under glass or in open beds, improves the quality as well as the quantity of the crop, and the process is not open to the objection that there is a loss of flavour, so common with vegetables forced in atmospheric heat. All plants may not respond to bottom heating, but there is no doubt about its advantage in the cultivation of tomatoes, lettuces, carrots, cauliflowers, radishes, and potatoes, as well as with many bulbs and flowers such as violets and pyrethrums, that always have a ready market. The actual technique of soil warming has still to be developed, but at present there is a choice between water heated by a boiler and carried in pipes buried in the ground and electrical heating by means of cables. The latter is by far the more satisfactory for convenience of working, as the cables are not rigid, but the costs are higher than in the case of the boiler. We believe that in the near future vegetable and fruit growers will make greater use of this method of cultivation.

PRESERVING FRUIT FOR OUT-OF-SEASON JAM

T. N. MORRIS, M.A.
(The Low Temperature Research Station, Cambridge.)

ONE OF the most important considerations connected with the manufacture of jam is that of the preservation of fruit for use out of season, either by the addition of a preservative or by freezing. The former method requires little initial outlay and can be readily applied by the average manufacturer or even by large growers or groups or growers; the latter is only available where there is efficient cold storage accommodation. In both cases, however, it is interesting to know what changes, if any, go on during storage and how far these affect the finished product. This is particularly true in regard to the pectin of the fruit since, although commercial pectin is always available to stiffen jams and jellies to the correct consistency, it is obviously desirable to preserve the natural pectin, both for its own sake and also because an undesirable change in a single constituent of the fruit is not likely to be the only one to occur.

The present article deals with some of the changes which take place in the pectin and other constituents of fruits during storage with sulphurous acid as a preservative or during frozen storage.

Preservation by Means of Chemical Preservatives

Sulphurous acid is the most important preservative used with fruits, and is the only one which need be considered here. There is no need to describe the technique for adding sulphurous acid or for handling sulphited pulp, this technique being now well established. It is sufficient to state that 0·15 to 0·2 per cent. of sulphurous acid is permitted in fruit pulp by the food regulations, and is effective in preventing the growth of all micro-organisms (moulds, bacteria, etc.) if distributed evenly throughout the material.

The immediate and well-known effect of sulphurous acid is to bleach the red or purple soluble colours of the fruit juices. Fortunately, however, the colour returns for the most part on boiling, although it may have to be supplemented artificially in the case of strawberries, which do not possess much colour initially. A less obvious effect of sulphurous acid is its tendency to toughen and harden the skins and other tissues of fruits. This is not serious with very soft fruits like strawberries and raspberries, but is sufficient to render jams made from gooseberries and black currants unpalatable. The reason for this toughening is not fully understood, but the fact that it can be prevented by pre-heating the fruit as described below points to enzymic causes. It is also unfortunate that sulphurous acid does not protect the pectin of all classes of fruits from destruction. For instance, if the juice is expressed from ripe, fresh raspberries and is allowed to stand in a vessel at room temperature it soon sets to a jelly, whether sulphurous acid is present as a preservative or not. This jelly must not be confused with the pectin-sugar jelly formed by boiling with sugar; it is merely a stage in the conversion of soluble pectin, through the action of hydrolytic enzymes, to pectic acid, which is finally thrown down as a flocculent precipitate when the jelly breaks up as it does in the course of a day or two. Other fruits in which the pectin deteriorates in this way in the presence of sulphurous acid are loganberries, strawberries, gooseberries, currants, and the skins of citrus fruits, and, since pectic acid has no jellying properties, such preserved material is useless unless it is supported by added pectin. Other fruits or portions of fruits like apples, the centres of citrus fruits and plums do not appear to be affected in the same way. Their juices do not readily clot when expressed, and both the juices and the solids can be preserved with sulphurous acid for long periods without loss of pectin although, in the case of plums, there will probably be some toughening of the skins.

In addition to preventing the occurrence of skin toughening, pre-heating to about 90° to 95° C. for 3 to 5 minutes, or long enough to destroy enzymes, also prevents the loss of pectin in the presence of sulphurous acid. This heat treatment is best carried out in the presence of sufficient water to cover the fruit, which is then cooled as rapidly as possible before adding the sulphurous acid. It is also a fact worth noting that, not only is the pectin protected under these conditions but, in all the tests carried out at the Low Temperature Research Station, its setting power became increasingly augmented with time, in some cases—*e.g.*, Victoria plums and apples—very considerably. This gives an added value to the method, which is applicable to fruits with plenty of colour like raspberries and black currants and to fruits like plums and orange centres with insoluble colours not affected by sulphurous acid. Strawberries, however, have, so far, yielded a very brown jam when treated in this way in the laboratory, and must either be preserved raw with sulphurous acid or in the frozen state by one of the methods described below, unless this browning can be

overcome. (Possibly the addition of sugar before heating would accomplish this, but it has not yet been tried, and might introduce inversion troubles in the finished jam.)

Preservation of Fruit by Freezing

If properly carried out freezing is probably the best method of preserving the natural colour, flavour and texture of the fruit for jam purposes. It also enables the manufacturer to state truthfully that neither artificial preservatives nor colour has been added to the jam.

The methods to be used and the temperature of storage depend on circumstances, and, of course, cost also has to be considered. In general, it is true that the lower the storage temperature the better the result, and, in any case, 14° F. should be regarded as the maximum temperature for the prolonged storage of any uncooked fruits. Whether sugar should be mixed with fruit before freezing depends on the nature of the fruit. Raspberries, loganberries, currants and blackberries store successfully at −14° F. for 6 to 8 months without added sugar, although there may be a slow but steady loss of pectin during this period; strawberries, however, give more reliable results if they are either mixed with half their weight of sugar (which should be given time to dissolve in the juice in a cool place) or covered with a 50 per cent. syrup—preferably pre-cooled. Plums, cherries, apples and any other fruits which tend to turn brown when bruised cannot be stored successfully at temperatures like 14° F. unless they are first pre-heated to destroy enzymes, as described under preservation by sulphurous acid. This heat treatment is also applicable to raspberries, gooseberries, currants and loganberries as an alternative to freezing them in the raw, fresh state. It is even successful with strawberries if half their weight of sugar is added before the heating, which should be carried out rapidly and followed by rapid cooling.

A further point in favour of heat-treated fruit consists in the fact that it can be stored successfully at temperatures like 20° to 23° F. or just below the limits for mould growth, with little or no change in colour, flavour or pectin content.

As regards the handling of frozen fruit for jam it will be found best to work with relatively small containers; in fact, these may conveniently be of a size to hold exactly enough for one boiling of jam. The contents can then be rapidly transferred to the jam pan and heated up from the frozen state, thus eliminating any deterioration during thawing. Finally, it should be added that, for success in freezing, the fruit must be in good, fresh condition when it enters the store. Any hope that fruit of poor quality will be improved by freezing is doomed to disappointment.

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PECTIN and PECTIN-SUGAR JELLIES

Their Chemical Structure and Composition Related to Practical Problems

By T. N. MORRIS, M.A.

PECTIN

ALTHOUGH PECTIN has been known to scientists for over a hundred years and is now a familiar substance commercially, its chemical structure and composition are still not precisely defined. There is no doubt that it is a methyl ester of pectic acid (itself a complex of galactose and arabinose with galacturonic acid) since it can be made to yield pectic acid and methyl alcohol on hydrolysis. The maximum number of methyl groups, however, which a single molecule of fully methylated pectin can carry is not certain, and the extent to which demethylation may have proceeded in any given sample depends on factors like the time and temperature of extraction and the acidity of the extracting medium, as well as on the nature and condition of the material used.

Commercial Extraction

The art of extracting pectin from its commercial sources, the chief of which are the albedos of citrus fruits and apple pomace, consists in striking a happy medium between the factors just mentioned. Extraction at a low temperature like 60° C. would be least destructive but is always incomplete. Working with dried and powdered lemon albedo Myers and Baker found that extraction at 70° C. and at a *p*H value for 1·45 for 1 hour gave an extract with a greater jellying power than at any other temperature, while at 100° C. their best result was obtained in 20 minutes at *p*H 2·15. With apple pomace boiled for varying periods of time with a 0·5 per cent. solution of citric acid, we have found that the jellying power of the extracts increased up to about 1 hour, and

subsequently began to decline in spite of a steady increase in the percentage of pectin in solution. This means that for the first hour the progressive extraction of pectin more than compensated for its deterioration or partial destruction through hydrolysis, although later the position was reversed.

It is significant that Myers and Baker, and also Nanji and Norman, find that chemical alteration (mainly demethylation) occurs comparatively slowly when pectin is heated in moderately acid solutions. Changes in viscosity and jellying power are, however, considerable, especially in the early stages of heating. Myers and Baker find, in fact, that changes in viscosity through the action of heat, acids, etc., go hand in hand with changes in jellying power, and although it is admitted that the more completely demethylated pectins will not form jellies with sugar, Myers and Baker state explicitly that the jellying power of a pectin sol from a given source can be measured in terms of viscosity irrespective of the percentage of pectin in the sol.

This result receives collateral support in the fact that a change in the viscosity of a colloid sol is not necessarily related to a change in its molecular composition, but may be more affected by matters like polymerisation and the state of aggregation of the molecules. Pectin probably exists in the cell walls of plant tissue in a highly condensed form in loose combination either with cellulose or with certain metallic salts through the elimination of water, and it can be well understood that such a combination would take time to become hydrolysed and extracted, especially in the deeper-seated portions of the cell walls. There would be a whole range of fractions varying in their degrees of polymerisation and viscosity according to the conditions of extraction. It can also be seen, incidentally, that the removal of the pectic substance from the cell walls through enzymic action during ordinary ripening and its passage into the fruit juice would also account for a considerable alteration in the texture of fruits at that period.

Other Factors affecting Extraction

Other factors which affect the extraction of pectin are the state of division of the pomace or other pectic material, and the degree of agitation during extraction. For instance, in tests at the Low Temperature Research Station, it has been found that the pectin in finely ground pomace could be extracted with 0·5 per cent. of citric acid in about half the time required for ordinary unground dried pomace, other conditions being the same. Furthermore, the ground material could readily be mixed with kieselguhr and pumped through an ordinary filter-pump, yielding a clear extract. It was also noticed that the speed and efficiency of extraction were increased by agitation, but no precise measurements in this connection were made; it is evident, however, that, in carrying out comparative extraction tests, it is important to have all the conditions identical.

THE PECTIN-SUGAR JELLY

Probably the most noteworthy contribution towards an understanding of the nature of pectin-sugar jellies has been made recently by Spencer, while Cole, Cox and Joseph and Olsen have made advances in other directions. Spencer has attacked the problem from the point of view of a trained colloid chemist, and considers that a pectin jelly is a precipitation phenomenon consisting of an agglomerated network of pectin molecules capable of supporting a mother liquor of sugar syrup containing acid (or alkali) and a very minute quantity of unprecipitated pectin. Spencer formed jellies with alcohol, glycerine, and even metallic salts as well as with sugar, and considers that the fundamental nature of all these is the same. Her view as to the structure of the jellies is supported first by the fact that dry, powdered pectin is insoluble in sufficiently concentrated solutions of the substances with which jellies are formed—*e.g.*, it would not dissolve in a 65 per cent. sugar solution—and, secondly, because the mother liquor of, say, a sugar jelly can be washed out and replaced partially or entirely by alcohol without destroying the identity or altering the volume of the jelly. Spencer's most revolutionary contributions are, however, connected with the rôle of acids in jelly formation.

Previous workers (Tarr, Ogg, Myers and Baker) had found, in making pectin-sugar jellies over a pH range varying from neutrality to a moderately high acidity, that the jelly strength rose from nil to a maximum at a definite pH value and then weakened again with increasing acidity either to a very low value or to nil again. Spencer, on the other hand, using a method for making jellies in the cold, came to the conclusion that this did not represent the true colloidal behaviour of pectin, but was due to the limitations of the hot method. She showed experimentally that, although the presence of acid assisted jelly formation, there was no optimum pH for jelly formation of the nature described by the previous workers, and that the acidity could be increased more or less indefinitely without any decrease in jelly strength. She found, further, that alkaline and neutral as well as acid jellies could be made with glycerine and alcohol, and that alkaline jellies could also be made with sugar. The only reason why neutral jellies could not be made with sugar was because the concentration of sugar which would be required to form these is greater than its actual solubility.

Weakening of Jellies

Spencer accounted for the weakening of jellies above a certain acidity in the case of the hot method by assuming that the hydrolysis and destruction of pectin had become very rapid. This, however, does not take into account the fact that Tarr had already varied the boiling periods of jelly mixtures and found no decrease in jelly strength, even after 40 minutes, thus establishing the fact that sugar greatly protects pectin from destruction during boiling in the presence of acid; hence it is necessary to look for a more tenable explanation. This is to be found in the work of Cole, Cox and Joseph, who have put forward the view that at high acid and sugar concentrations the speed of setting of jelly mixtures tends to increase to such an extent that setting begins either before they can be poured or even during boiling. As a result of being disturbed at a critical period such mixtures either com-

pletely fail to set or else set to a weak and broken jelly. This view is further supported by the work of Olsen, who showed that with slow setting mixtures of low final sugar concentration (60 per cent.) there was no optimum *p*H for jelly strength even by the hot method, although he found optima with mixtures of higher sugar concentration (65 and 70 per cent.) which set more quickly.

Rates of Setting

From these considerations it appears that trouble from premature setting may sometimes be prevented by filling jellies very quickly after they have reached the correct sugar concentration or, possibly, by devices designed to keep the concentration of one or more of the ingredients low until the last possible moment before filling.

Cole, Cox and Joseph also suggest the use of slow-setting pectins and, in this connection, the influence of salts on the rate of setting is of interest. Spencer has mentioned that certain salts delay setting, although no experimental details were given. At the Low Temperature Research Station, however, the effects of small additions of citric acid and sodium citrate on the rate of setting of red currant jelly have been studied. It was found that citric acid slightly increased the rate of setting in spite of a fairly high original acidity. On the other hand, very small additions of sodium citrate caused an appreciable delay, and when as much as 4 g. was added in making 810 g. of jelly, setting did not begin until 6 hours after pouring, although the final jelly strength after 3 days' standing without interference was slightly above that of controls containing no added salt. This action by a citrate is probably connected with the fact observed by Spencer that the pectin molecule adsorbs citrate ions more readily than tartrate, chloride, and many other ions. Such an adsorption of a negative ion increases the total negative charge on the pectin molecule and thereby renders its precipitation more difficult. The fact that the citrate ion is so readily adsorbed may also account for the fact that jellies made with citric acid tend to be slightly weaker than those made with tartaric acid, while these again for the same reason are weaker than those made from hydrochloric or sulphuric acids.

Weeping of Jellies

Another phenomenon sometimes causing trouble with jellies is that of "weeping" or syneresis, which is said to be particularly prevalent with jellies high in acid and low in sugar. Myers and Baker associate it to a great extent with high acidity, and suggest that the addition of buffering salts like sodium citrate may sometimes be beneficial, although they state that syneresis will occur in any jelly where the total ionic concentration is too high. Spencer, on the other hand, points out that syneresis always occurs with jellies like those made from alcohol, in which the non-pectinous mother liquor is of low viscosity. She therefore suggests that the phenomenon may be checked by having the sugar concentration high, so as to render the mother liquor more viscous. In view of these differences of opinion, however, it seems that further research on this problem may be required.

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PECTIN PREPARATIONS OF HIGH JELLYING POWERS

ACCORDING to U.S. Patent 2,008,999 issued to the Wallerstein Company, Inc., of New York City, pectin preparations of high jellying powers can be made from apple pomace, citrus fruit peels, beet pulp, etc., by treating these materials at comparatively moderate temperatures with a solution of a strong inorganic acid.

The higher the concentration of the acid solution, the lower the temperature should be during the digestion and extraction; similarly, the higher the temperature, and the higher the acidity of the treating solution, the shorter the time during which the solution should act.

By controlling the digestion and extraction treatment so that the product will be substantially precipitated by calcium chloride solutions between a hydrogen ion concentration of 3 and 7, such products will be of very high jellying power and a good yield, it was found.

The proper time or duration for digestion and extraction of the pectin can be easily determined, it is stated, by precipitating from time to time samples of the digesting liquor so dissolved, and testing the same for the jellying power.

An example given in the patent paper concerns a pectin made from dried apple pomace, the resulting preparation being free from starch: 100 lb. of dried apple pomace are digested with 75 gal. of 0·1 normal sulphuric acid at a temperature of 60° C. for about 40 hours. The N/10 solution of sulphuric acid before addition to the pomace had a *p*H of 1·2, and the mixture of pomace and N/10 sulphuric acid had a *p*H of about 1·5. This last *p*H is maintained substantially constant throughout the digestion.

The content of the solution in pectinous substances of high jellying power, and accordingly the jellying power of the extract, increases to a certain point; then the jellying power of the extract decreases again on account of the decrease of the jellying power in the dissolved pectins.

SUGAR SYRUPS

Their Preparation for use in the Mineral Water, Fruit Cordial, Squash, and Canning Trades

IN MANY food manufacturing businesses, at some stage or another in the process, the preparation of sugar syrups is a fundamental operation, and although it is intended in a later article to deal more particularly with the mineral water industry, the general methods of preparation of sugar syrups is of wide appeal, and will no doubt interest food manufacturers who are keen not only on the technical side, but on the accountancy side of the business.

Sugar is often one of the most costly raw materials used in any considerable quantity by food manufacturers, owing partly to the fact that it is a dutiable material, and partly to the involved process of purification which is necessary to produce the high quality sugar of to-day. Unless syrup strengths are carefully controlled and waste cut down to a minimum, the sugar bill may, at the end of a year, be considerably in excess of the "book" amount. Even small variations of 1° or 2° Brix may be responsible for the margin of profit being reduced appreciably, whilst waste of sugar or sugar syrup on the floors or plant constitutes, quite apart from considerations of cost, a very serious danger as a breeding ground for yeasts and other organisms, which might ultimately be the cause of infection of the finished product, whether it be mineral water, canned fruit, or cordial.

The Sugar Tables

There is much information published on what might be called the mathematical side of sugar syrups. Recognised tables have been drawn up showing the amounts of sugar which must be added to 1 gal. of water to produce syrups of various strengths; also, as a rule, the volume of syrup produced from 1 gal. of water for each strength of sugar syrup is usually given. It may seem unnecessary to draw manufacturers' attention to the usefulness of these tables, but it is surprising to find how many smaller manufacturers do not make full use of them, particularly when residues of syrup of a certain strength are required to be altered for use in another line. Again, often when the tables are used it is considered sufficiently accurate to mix the correct quantities of water and sugar and to rely on the final strength being correct, without going to the trouble of checking by means of a hydrometer. If the hot process is used, difference between the theoretical strength or specific gravity, and the actual, may be very considerable, due to a loss of water during evaporation. Unless the strengths of such syrups are checked by means of a hydrometer, the error may prove very costly.

There are, in common use, three methods of making syrup for food manufacturing processes, and although there is undoubtedly something to be said in favour of each, a great deal will depend upon the existing conditions, such as available space, output, etc., of each factory when the question of syrup making is being worked out. These three processes may be described as the hot process, the cold process, and the storage process, and it will be well to describe them separately.

(1) *The Hot Process*.—This is probably the oldest process, in which the sugar is usually hoisted, on delivery, to the highest point in the factory. There the requisite quantity is weighed out and run down a chute (often made of wood lined with galvanised iron) into steam-jacketed pans ranging in capacity from 40 gal. to 200 gal. A measured quantity of water—the amount necessary to produce the desired strength as determined from the sugar tables—is added, and the steam (at about 60 to 100 lb. per square inch pressure) turned on. With gentle agitation it does not take long to effect solution, and this usually occurs some time before the syrup actually begins to boil. The syrup is then run again by gravity through some form of filter, which may be either fine cloth or, in some cases, a fine mesh woven-wire sieve may be used. Sugar invariably contains quantities of foreign material,

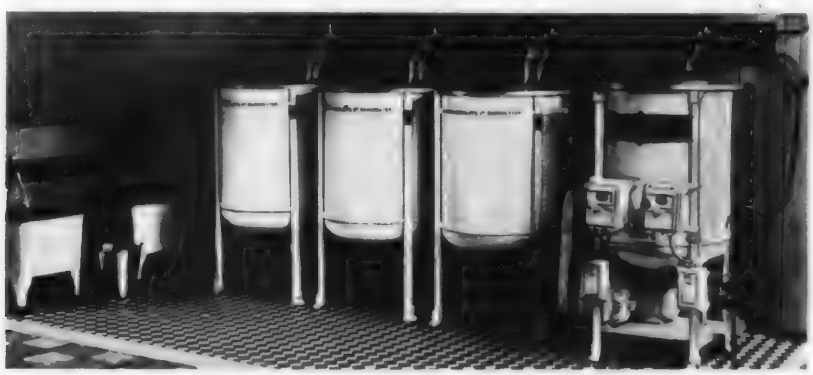


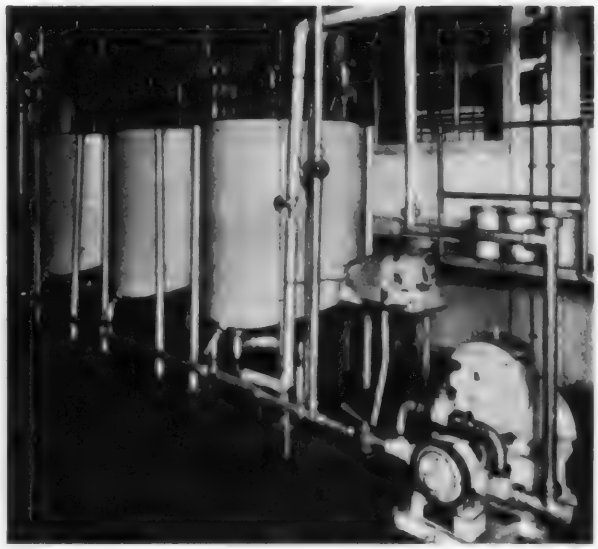
Illustration of a Syrup Room, showing on the right the mixer with three storage tanks next to it. With acknowledgments to Bratby and Hinchliffe, Ltd.

such as hairs from the sack, bits of wood, etc., and it is astonishing what can be collected on the sieve in the course of a day's run, even when using a good quality granulated sugar. A sieve of some sort or another should never be dispensed with.

The main advantage in the hot process is the sterilisation effect which is produced, particularly if any fruit acids, such as citric or tartaric, which may be necessary, are added at the time of the sugar boiling. Certain troubles with manufactured foods have from time to time been traced back to infection through the sugar, and a notable instance of this is the flat-sour spoilage of peas and other vegetables which has in the past caused tremendous losses to canners in America and elsewhere. Unfortunately a number of organisms, including the flat-sour strains, are very resistant to heat treatment, and it should not be inferred that the boiling of sugar syrups by this hot process will necessarily produce a sterile syrup, even when acid is present. It may, however, be safely assumed that the risk of spoilage is reduced by the adoption of such a process.

As is nearly always the case with alternative processes, there are disadvantages resulting from the use of the hot process. One such disadvantage, which does not appear to be so fully appreciated by many manufacturers as it deserves, is the fact that when a batch of syrup has been made, the temperature approximates to boiling point, and unless a sample taken for strength determination is cooled down to 65° F., a considerable correction to the reading obtained on the hydrometer is necessary, in order to arrive at the actual strength. When it is remembered that syrup rooms are very often run by semi-skilled employees, this need for correction may be the cause of inaccuracies. Further, when a quantity of syrup has to be measured, a correction is also necessary, due to the volume increase of hot syrup as compared with cold. These two disadvantages apply to processes where hot syrup is actually going to be used in the subsequent manufacturing process, but it often happens with many products, such as mineral waters, that it is either impracticable or unwise to use a hot syrup, and in these cases it becomes necessary to cool to room temperature for use. Unless this cooling is carried out quickly in clean plant, all the good work done towards sterilisation during the boiling process may very quickly be undone at this stage. Warm syrup exposed to the atmosphere is an ideal breeding ground for yeasts and other organisms, and unless the cooling is efficient there is always the risk of subsequent trouble.

If acid is added to the boiling, a certain amount of the cane sugar is converted to invert sugar, and this is thought by many people to be an advantage. Whilst it is probably not a disadvantage, the actual benefit obtained, both from the technical and nutritional point of view, would appear to be very slight. Technically, sugar syrups in such products as squashes, canned fruits and mineral waters are sufficiently dilute to prevent any crystallisation, and whereas with the higher concentrations of sugar such as occur in jams and jellies, the presence of invert sugar is important in order to prevent crystallisation, its presence in products consisting of dilute syrups is almost immaterial. From the nutritional point of view, invert sugar is certainly more readily assimilable by the human body, but, again, the conversion of cane sugar into invert sugar by the digestive juices is so rapid that free inversion by boiling with acid might be considered to be of little real value.



A Pfaudler glass-lined "Kwik-Mix" Syrup Making machine and two syrup storage tanks at J. Lyons and Co., Ltd., London.

(2) *The Cold Process.*—In the old days the preparation of sugar syrup in the cold was very laborious, owing to the time required to effect solution. The stronger the syrup, the more difficult was it to prepare. Efficient pans, containing suitable rousing gear, have now been designed, and on a plant capable of holding about 50 gal. of syrup it is possible to prepare completely, including charging, mixing and filtering, a 50° Brix syrup well within half an hour. Employing one or two of these units a continuous discharge of syrup can be obtained at very low cost.

With this type of plant there is, of course, no loss due to evaporation, and the theoretical quantities of sugar and water, as determined from the sugar tables, will invariably produce the calculated strength of syrup. At the same time, a continuous check should be made by means of a hydrometer to ensure that no errors in weighing or measurement have been made. Syrup made in the cold in this way is easy to handle, and the undesirable operation of cooling becomes obviated. Cold process syrup cannot by any means be said to be sterile, but if it is filtered through fine texture flannel material, a great proportion of the impurities are removed. The method of doing this is to draw off the syrup through a filter pad in the bottom of the mixing pan by means of a centrifugal pump. Experience has shown that the cold process is safe for mineral water and other syrups, provided that the plant is always kept scrupulously clean.

(3) *The Storage Process.*—In factories where a continuous supply of sugar syrup of the same strength is required, one of the above processes is usually adopted, but in many cases, where a number of lines are being produced, it happens that syrups of varying strengths are required throughout the day. In such cases it is often convenient to make up a supply sufficient for the day's

run of a fairly strong syrup, probably 60° or more Brix. As a rule this is done by the hot process, and the syrup is stored in a suitable tank and measured quantities are diluted with water throughout the day in order to produce the various strengths required. It is a bad practice to hold weak syrups for any length of time, but in concentrated solutions sugar acts as a preservative against yeasts and bacterial growths. It is therefore quite safe to store such concentrated syrups, but these should always be covered to prevent contamination. It is an easy matter to calculate the quantity of water which it is necessary to add to this syrup in order to produce any desired strength, and in the case of a factory where one syrup room supplies several sections, it is a very convenient way of dealing with the operation. For example, suppose that the stock of syrup is 61° Brix and that it is desired to make three separate lots of 50 gal. at a strength of 30°, 35° and 45° Brix respectively. From the sugar tables it is ascertained that the weight of sugar contained in 1 gal. of the syrup is 7·89 lb. To produce:

(*a*) 50 gal. of syrup at 30° Brix—

1 gal. of 30° Brix syrup contains 3·38 lb. of sugar (from table). Therefore 50 gal. of 30° Brix syrup contains 169 lb. of sugar.

1 gal. of 61° Brix syrup contains 7·89 lb. of sugar.

Therefore $\frac{169}{7·89}$ gal. of 61° Brix syrup will be required = 21·4 gal.

Therefore, 21·4 gal. of 61° Brix syrup should be made up with water to 50 gal.

(*b*) 50 gal. of syrup at 35° Brix—

1 gal. of 35° Brix syrup contains 4·03 lb. of sugar (from table). Therefore 50 gal. of 35° Brix syrup contains 202 lb. of sugar.

1 gal. of 61° Brix syrup contains 7·89 lb. of sugar.

Therefore $\frac{202}{7·89}$ gal. of 61° Brix syrup will be required = 25·6 gal.

Therefore, 25·6 gal. of 61° Brix syrup should be made up with water to 50 gal.

(*c*) 50 gal. of syrup at 45° Brix—

1 gal. of 45° Brix syrup contains 5·42 lb. of sugar (from table). Therefore 50 gal. of 45° Brix syrup contains 271 lb. of sugar.

1 gal. of 61° Brix syrup contains 7·89 lb. of sugar.

Therefore $\frac{271}{7·89}$ gal. of 61° Brix syrup will be required = 34·3 gal.

Therefore, 34·3 gal. of 61° Brix syrup should be made up with water to 50 gal.

Cane Sugar or Beet Sugar?

Before concluding, it would probably not be out of place to mention the very controversial subject of the relative values of cane and beet sugars. Actually, although the word "sugar" in commerce refers to cane or beet sugars, the word really describes a whole group of substances which are chemically alike and which possess in a varying degree a sweet taste. Some of these are, as yet, only of academic interest, whilst others, such as glucose, lactose, etc., are fairly well known. The chemical term for cane sugar and beet sugar is "sucrose", and whether it is derived from the sugar cane or the beet, it is the same substance. Commercially, sugar contains not less than 99·5 per cent. of sucrose, and often more. Therefore, unless the remaining 0·5 per cent. is a very powerful substance, it will be obvious that there can be no material difference between the two sugars. Actually, the majority of this residue consists of water, and whilst in the early days of beet sugar manufacture there was a higher proportion of substances other than sucrose and water than in cane sugar, to-day this difference is difficult to find by analysis. Technically and in practice, food manufacturers need have no preference for either cane or beet sugar, and although now and again we find people who express a definite preference for one or the other for certain purposes, the evidence on all sides conclusively discounts such opinions. One case has actually been known where a food manufacturer complained to his sugar suppliers that a delivery of cane sugar was "not so sweet as a previous delivery of cane sugar". He suggested that beet sugar had been substituted for his order. This was the first intimation that the suppliers had that the manufacturer wanted cane sugar. Unknowingly, he had been using beet sugar for the past three years!

TABLE SHOWING THE RELATIONSHIP BETWEEN DEGREES TWADDELL, DEGREES BRIX, POUNDS OF SUGAR TO BE ADDED TO ONE GALLON OF WATER, AND VOLUME OF SYRUP PRODUCED FROM ONE GALLON OF WATER.

Degrees Twaddell.	*Degrees Brix* (i.e., *Percentage of Sugar by Weight*).	*Pounds of Sugar to be Added to Each Gallon of Water.* (*Lb.*)	*Volume of Syrup from 1 Gal. of Water.* (*Gal.*)
26	30	4·30	1·269
27	31	4·50	1·281
28	32	4·72	1·294
29	33	4·94	1·309
30	34	5·17	1·323
31	35	5·40	1·338
32	36	5·64	1·353
33	37	5·89	1·369
34	38	6·14	1·384
35	39	6·41	1·401
36	40	6·69	1·419
37	41	6·97	1·437
38	42	7·26	1·454
39	43	7·56	1·474
40	44	7·88	1·494
41	45	8·20	1·514
42	46	8·55	1·536
43	47	8·90	1·558
44	48	9·26	1·580
45	49	9·64	1·604
46	50	10·03	1·628
47	51	10·44	1·654
49	52	10·86	1·681
50	53	11·31	1·710
51	54	11·77	1·739
52	55	12·26	1·770
53	56	12·77	1·803
54	57	13·29	1·837
56	58	13·85	1·871
57	59	14·43	1·907
58	60	15·05	1·948
59	61	15·69	1·980
60	62	16·37	2·032
61	63	17·08	2·077
63	64	17·84	2·124
64	65	18·62	2·174

SUGAR BEET *and* *the* BRITISH SUGAR CORPORATION

By T. H. FAIRBROTHER, M.Sc., F.I.C.

ALTHOUGH THE development of the sugar beet industry in Europe was directly due to the efforts of Napoleon, indirectly the British Navy was responsible, for it was the pressure of our naval blockade in the early part of the nineteenth century that cut off continental supplies of sugar from the West Indies. As we had gained control in those islands and dominated most sea routes in the inimitable fashion of British sailors of those days, it was a relatively simple matter to prevent any sugar getting into the Continent. Napoleon, great man as he was when faced with an emergency, took vigorous measures, and soon sugar factories sprung up like mushrooms all over France and Germany, and by the time the war was over in 1815 the sugar beet industry in Europe was established, and has remained ever since. We in England have never had any need for home produced sugar (except in 1914-18, which was an exceptional period, and even then supplies could have been obtained if we had possessed adequate means of transport). Our colonies were capable of producing all the sugar cane and all the sugar necessary in a most economical manner. Instead of fostering and cultivating these resources we allowed them to fall into neglect, and at the same time listened sympathetically to the arguments of those misguided individuals who have always urged the production of home grown sugar, no matter at what cost. Obviously the prospects of the fostering of home grown sugar are directly proportional to the opinions of the Exchequer. If the duties on foreign sugar were removed or reduced, home grown sugar would not have a look in. For some obscure reason the Governments of all political shades of opinion seem to have favoured the home industry and have allowed home grown sugar to be free from duty.

The Effect of the War

There can be little doubt that it was the heavy duty of about 25s. a cwt. imposed after the outbreak of the war of 1914 that made the existence of a home grown sugar industry possible. In the shelter of such heavy taxation of foreign supplies the industry took root, and later on, when it ought to have been facing world competition, its sponsors managed to persuade the Government that sugar beet was one of the solutions of post-war unemployment and would ultimately prove to be the salvation of British agriculture, and in 1925 Mr. Snowden made one of the biggest of his many political mistakes in introducing the British Sugar (Subsidy) Act. By this not only did home produced sugar get a duty preference, but also a subsidy, which started at the absurdly high rate of 19s. 6d. At first we were told that this subsidy would gradually be diminished until in ten years it would disappear altogether. Now after twelve years the clamour for the subsidy is as loud as ever, and the industry which the Government by coddling and subsidising hoped to make self-supporting is to-day as helpless as ever.

The Greene Committee

When the subsidy period had run its allotted span the Government did not stop the subsidy, as they clearly ought to have done in the spirit of the Act of 1925. They merely decided to look into the matter, and the Greene Committee was appointed to investigate the whole business. After a long and painstaking investigation this Committee issued its report in April, 1935, and unfortunately it was not unanimous. The majority report stated that "the advantages resulting from the existence of a beet sugar industry are not sufficient to justify a recommendation to continue assistance to the industry". The report reviewed very clearly the world sugar situation and indicated the exact position of the United Kingdom sugar industry with particular reference to beet sugar. It was stated that "we came to the conclusion that neither the proposed marketing schemes in their present form nor any possible reorganisation within the existing framework of the Agricultural Marketing Acts would be wholly adequate to secure the objects which we considered necessary". It was recommended that the subsidy be discontinued, but that the farmers should receive interim assistance to help them over the transitional period until they had found alternative crops at the rate of £3 per acre for the first year, £2 for the second, and £1 for the third.

Sugar Shilly-shallying

After the issue of the Greene Report the Government indulged in a process of masterly procrastination. Clearly on the horns of a dilemma, with a General Election looming close ahead, the Government shelved the problem and delay followed delay. However, at the end of June, 1935, the Government decided to continue the subsidy for another twelve months, and in the meantime the sugar factories were declaring fat dividends and cash bonuses. The English Beet Sugar Corporation paid a 12s. bonus on a £1 share, and dividends of 15 per cent. were common. This is a most flagrant case of robbing the consumer and taxpayer to help vested interest.

The Reorganisation Bill

Eventually the General Election came before its time, and fortunately for the Government they were not forced to fight it on issues of their agricultural policy. It was

the war clouds looming over Europe that sent back the National Government with another cast-iron majority. Sheltering behind this majority and their new lease of life, the Government have now produced the Sugar Industry (Reorganisation) Bill. This was to some extent foreshadowed by the Greene Report. The majority of the Committee evidently had their doubts about the Government's accepting their reasoned sane counsel, and provided a plan of organisation and assistance if the State decided to continue with the industry. They suggested that the sugar industry should be controlled by a Permanent Sugar Commission and that the beet sugar interests should be amalgamated. It was to give effect to these recommendations that the Sugar Industry (Reorganisation) Bill was introduced. As might be expected, it met very little opposition in the House of Commons—its opponents sadly missed the rapier thrusts with which Sir Herbert Samuel would have pierced the armour of plausibilities which sheltered the Act. The last development has been a Government White Paper on the whole project.

The White Paper

This was issued to explain the new scheme for the amalgamation of British beet sugar factories into one single body—the British Sugar Corporation Limited. Details of this have appeared in many newspapers, and most readers will know that it is to be capitalised at £5,000,000 and that the Government are not only guaranteeing one million of debentures, but also a minimum dividend of 4 per cent. on the share capital. In return for this the Government are to be allowed to appoint an independent chairman, who will have a right of suspensory veto, and, moreover, the appointment of every member of the Board is to be subject to Government approval, while two members are to be appointed by the Government. Actually this does not mean very much to the taxpayer, who has already provided about £50,000,000 for this pampered industry. So far as one can see, all that has been provided has been some sort of management committee that may manage things a little less badly than has been the case hitherto. The taxpayer has still to go on providing the money, whether it is managed or mismanaged. A little sugar plum has been dangled in front of the taxpayer's eyes. *If* any economies are effected in the working of the factories, part of them will go back to the Exchequer, and so, presumably, to the taxpayer indirectly. We are told that with a bit of luck economies of £300,000 may be made within the next half-dozen years, and this, one must assume, is to be the taxpayer's sugar plum. It seems to have dwindled down to the size and flavour of a very sour and immature sloe! When fifty millions have already been frittered away and further millions are bespoken for future futilities, the remote prospect of an aliquot part of the problematic economies that may be effected seems most fantastically absurd. Very few taxpayers will view the investment of millions, with a remote possibility of a fractional return at some unspecified future date, as sound finance, but there it is. The Government have said it—therefore the taxpayer must pay up and try to look sweet.

Some Limitations

The acreage devoted to beet will probably remain about the same as previously, for the standard quantity of sugar to be produced is fixed at 560,000 tons. If the total output exceeds this quantity there will be a slight cut in prices (not exceeding 1s. a ton); and, on the other hand, if the crop does not produce this amount, an increase in price will be allowed. The price to be paid to the growers by the factory is 35s. a ton delivered, with one or two exceptions where special circumstances demand special prices. The price is based on the sugar content of the beet produced. The datum line is 15½ per cent. sugar, and for each 1 per cent. variation above or below this there will be an addition or deduction of 2s. 6d. As the sugar content of beet varies with climatic conditions, it is quite likely that this price variation will become a matter of annual adjustment, and this is not a particularly desirable state of things.

The Cost

Every user of sugar, whether from a manufacturing or domestic point of view, and every taxpayer who, year after year, woefully contemplates the raids on his earnings and wonders when a pound earned will ever be even fifteen shillings to spend, will want to know what this industry, which employs meagrely so small a proportion of the population but benefits lavishly a much smaller number of shareholders, is going to cost. The standard rate of direct bounty is to be 5s. 3d. per cwt. so long as the price of 96 per cent. raw sugar maintains an average of 4s. 6d. per cwt. If this average price happened by any chance to rise to 5s. per cwt. (and the sponsors of the Bill even think this possible), the bounty would fall to 4s. 9d. It seems more likely that there will be a fall in the price of raw sugar. In any case, looking at it in the most optimistic manner, this bounty will cost the taxpayer round about 2¾ million pounds. But in addition to this the duty preference will still be maintained, and the taxpayer will, therefore, be deprived of the duties that would have been paid into the Exchequer if the sugar came from abroad. The actual amount of this duty is difficult to estimate, as it varies according to the proportion of sugar which factories sell as white sugar suitable for direct consumption or as raw sugar to the refineries, but the Chancellor of the Exchequer has recently estimated the total which the Revenue will lose by growing our own sugar (duty free) instead of buying it abroad (dutiable) at nearly 3 million pounds. It is therefore reasonably correct to state that, apart from anything else, these two factors alone will cost the taxpayer about 5½ millions a year, and in face of this people talk glibly about a share in a possible economy of £300,000 a year a few years hence!

A Possible Monopoly

There are one or two points of importance that are left rather obscure in the Bill. One would imagine that with the bounty and duty preference the new Sugar Corporation should have little difficulty in disposing of the

560,000 tons allotted to home production, as this is only a quarter of the country's needs. There is, however, an agreement between the refiners and manufacturers of home grown beet sugar which regulates the home market for consumable white sugar. This is protected by a special additional Customs duty of 2s. 4d. per cwt. over and above the standard rate of 9s. 4d. levied on raw sugar, and the market for this is divided up among the different producers in definite proportions. So that all competition is eliminated. According to the Greene Report, this arrangement allowed refiners and manufacturers to charge 6d. per cwt. more for sugar than is justifiable, and the proceeds of this are divided among the various parties to the agreement. As far as one can gather, it is the Government's intention to perpetuate this state of things, and, in addition, the refiners, presumably in return for favours already received, are to contribute a further sum of about £300,000 a year in support of home grown beet. This arrangement leads to the possible creation of a monopoly. All refiners in the country are to be registered so that these various sums may be divided among them in the correct proportion as determined by their output. This obviously leads to a licensing scheme whereby the Sugar Commission will have power to prohibit any new refining undertaking entering the field. Hence it seems quite likely that a complete monopoly may be established for the sale of sugar to the public. All competition is to be eliminated and the consumer held to ransom, and for what purpose? Merely to secure for the home grown beet industry a further sum of 1s. or so a cwt. over and above the bounty which it is ostensibly receiving. Of this shilling, sixpence is to be paid directly by the refiners, and the other half will be provided by the extra price which the agreement allows the British Sugar Corporation to charge the consumer for white sugar.

To Sum Up

Enough has been said in this article to show that the Government are determined to continue with the unprofitable industry of home grown sugar. They have disregarded the majority report of their own Commission and have pledged themselves to the further expenditure of millions of public money to benefit a fragment of British agriculture (that could easily be employed usefully in other directions) and a small body of shareholders in sugar factories. They have adopted measures that will eliminate all competition and which will restrict production to those already in the field, and thereby have sown the seeds of a first-rate monopoly in the sugar industry. Sugar is an essential part of a balanced diet. It is one of the most important of energy providers, and as such should be made available as plentifully and cheaply as possible. There are abundant sources of cane sugar in the British Empire, and enormous quantities could be produced cheaply and economically and more than meet all demands. Yet, in order to pamper a very small section of British Agriculture, which could be more profitably employed, to flatter the opinions of a few theorists with no sense of perspective, and to swell the dividends of a few shareholders, the Government not only prevent the consumer getting full supplies cheaply from the Colonies, but also fleece him to the extent of millions a year. The whole situation is a scandal, and the only redeeming feature of the new Bill is that the production in future is to be restricted to 560,000 tons a year. If the industry is profitable, why restrict it—and if it is not profitable, why continue with it?

THE SOCIETY OF CHEMICAL INDUSTRY

LORD LEVERHULME has been nominated as President of the Society for the ensuing year; Dr. L. H. Lampitt is the new Hon. Treasurer, and Mr. J. Davidson Pratt the new Hon. Foreign Secretary.

The officers of the Food Group of the Society for the Session 1936-1937 will be as follows: Chairman, Dr. Franklin Kidd; Vice-Chairman, Professor H. Raistrick; Hon. Treasurer, Dr. H. E. Cox; Hon. Secretary, E. B. Anderson.

Of the four vacancies on the Committee, two will be filled by Dr. L. H. Lampitt and B. G. McLellan, and the two remaining places will be filled by the members at the Annual General Meeting in London on Wednesday, May 13, 1936, at 2.30 p.m., at the London School of Hygiene and Tropical Medicine, Gower Street, W.C. 1.

The Group are holding their 1936 Summer Meeting at Cambridge on June 26 and 27. The programme arranged is as follows:

Friday, June 26.

From 2 p.m. onwards members will be the guests of Messrs. Chivers and Sons, Ltd., of Histon. Motor coaches will convey the party to various farms and establishments demonstrating fruit growing, picking, and packing, egg packing, stud farms, etc. At 5.30 tea will be served on the lawn at Histon.

Saturday, June 27.

9 to 11 a.m., in the Physiology Lecture Theatre. Professor E. K. Riddell, "Food Problems and Surface Chemistry"; Professor F. C. Bartlett, "Taste and Smell"; Professor F. L. Engledow, "Quality of Crop Products from the Agricultural Point of View".

11.30 a.m. to 1 p.m., visit to the Low-Temperature Research Station (Superintendent, Dr. F. Kidd).

1.15 p.m., lunch in College.

2.30 p.m., visit to Dunn Nutritional Laboratory (Director, Dr. J. L. Harris).

THE ORMEAU BAKERY

The Ormeau Bakery of Belfast, founded on ideals and worked with ideals, is especially described for FOOD MANUFACTURE by E. B. BENNION, M.Sc., A.I.C.

LAST SUMMER I was privileged to visit the Ormeau Bakery, of Belfast, through the kindness of the Managing Director, Mr. J. Wilson, and to spend a considerable time in it watching all the various operations carried on, and studying the methods of production. Further, I feel greatly privileged in having been granted permission to write about it and in having been supplied with so many photographs to illustrate this article. Whilst many have been privileged to visit this bakery, no one has previously been granted permission to describe it for publication.

This bakery is situated some distance outside the business quarter of Belfast, overlooking Ormeau Park. The illustration above (Fig. 1) shows a general view of the bakery.

Spaciousness and hygiene have been the guiding features in the erection of this bakery, consideration of the workers and the elimination of fatigue, with particular consideration to the maintenance of a high standard of health, the guiding features in organising the work.

Whilst the mechanical equipment of this building and the layout has been done with great foresight and thought, the welfare of the workers and scientific methods of production have been given prior consideration.

Workers' Welfare

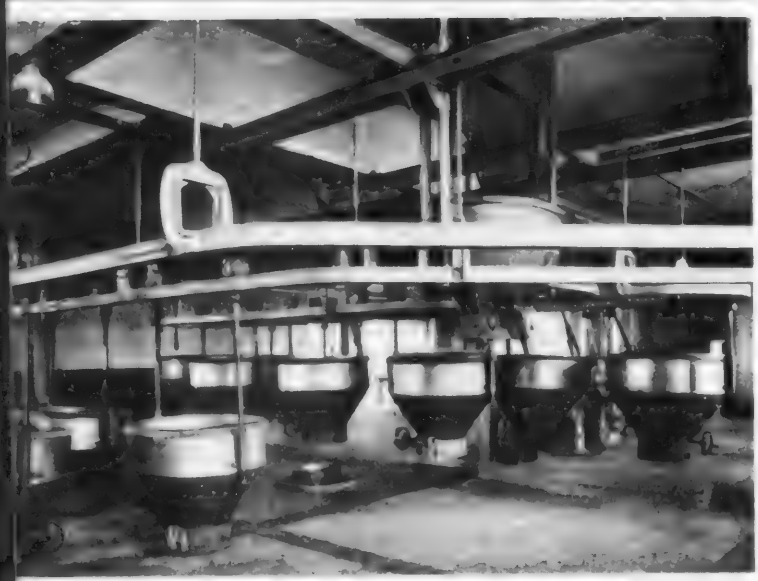
Since this business is engaged on the production of the most important article of the daily dietary of thousands of people, the aim of this firm has been to have the most hygienic methods of production.

To commence with, no one is employed who cannot pass the medical examination carried out by the firm's doctor, who attends daily. A complete medical record is kept of each person employed, and an annual inspection carried out. Before any employees can commence their daily work each one must have a shower bath and change into a complete set of working clothes kept in lockers in well-equipped changing rooms. When this practice was instituted the pessimists outside said work-people would jib at this condition, but they have been proved wrong by the fact that there is a long waiting list hoping to get a position in the course of time when suitable openings occur. Very rarely do cases arise where these conditions are not followed, because non-compliance means dismissal, and very few people would like to lose a job because they refused to keep clean! A shower bath is also taken before leaving work.

The result of this system is that when you see the people going home after their day's work you could not distinguish them from city workers in their smartness of attire. Further, they look a good deal fresher than those who work in the dirtier parts of the city.

In the equipping of the building all that can be provided for the comfort of the workers has been provided. A canteen adjoins the main bakery, and breaks are allowed for refreshments other than the ordinary mid-day break.

Fig. 1.—**The Ormeau Bakery, Belfast, from Ormeau Park.**



Production

The bakery is engaged on the production of bread of many kinds as well as confectionery. The keynote is quality throughout, and because it was apparent some years ago that even high-class quality confectionery, made by professional confectioners, did not appeal to many of the residents of Belfast, a special home-made cake section was started under a special manageress with a separate staff. As a result a most successful trade has been built up. In this way not only has the development of small home-made cake shops been forestalled, but a large clientele has been attached to the business who purchase now many of their normal baking lines.

From the viewpoint of studying bakery plant the bread plant provides much interest, for it is unique at present, although further units are to be constructed in the near future in Glasgow at the United Co-operative Baking Societies' new bread bakery.

When the bakery was being erected, Terazzo floors were laid, and so the engineers had to devise means of taking moving plant off the floors so that damage would not be done to them by the moving over them of pans, troughs, or trolleys laden with bread or dough. This was overcome in two ways: first of all, by the installation of the special dough conditioning plant shown in Fig. 2 and by means of overhead rails, as shown in Fig. 3. Both these plants were designed by the firm themselves and the patents are held by them.

At the top of the building is the flour loft. All the flour is delivered in calico non-returnable sacks. All the millers send the flour in these sacks, on which is printed, "Ormeau Bakery, Belfast", and not the name of the miller!

Again another example of the insistence of hygiene in production methods.

The flour and water pass through automatic weighing plants into the dough mixers. In the plant used for Irish batch bread the doughs are made in the older type of Viennara mixer, so that the dough can easily be transferred from the mixer through chutes in the floor to the special dough containers into the automatic dough conditioning plant in the floor below. Fig. 4 shows these mixers delivering the dough.

Dough Conditioning Plant

On the top floor of the dough conditioning plant the nickel containers of inverted funnel shape are staggered

The illustrations (Figs. 2-5 and 6-9) reading down the page are described as follows:

Fig. 2.—**The Patent Dough Conditioning Plant on the second floor which is fed from the floor above and discharges into the automatic plant on the floor below.**

Fig 3.—**The Automatic System of dough conditioning for brown and fancy breads on the second floor. There are no wooden troughs. All are made of nickel.**

Fig. 4.—**Two Viennara Kneaders on the third floor, which are fed from the floor above, showing discharge into automatic dough conditioning plant on the floor below, where there are also four other kneaders.**

Fig. 5.—**The Automatic Plant, showing patent feed to dividers.**

round a revolving platform so that there are a sufficient number of containers to keep a regular supply of doughs to the oven. After the doughs have stood for the requisite length of time in these containers, they pass to the containers on the platform below. This transference is performed by opening the bottom of the container by means of the handle shown at the side of each. This is in the nature of a valve. The valve moves on a central axis and so permits of the dough dropping through into the container below. As the dough passes through it is cut through the centre by the valve, which acts like a knife. Furthered by the drop, the dough is stretched, and so not only is all surplus gas removed, but some development of the dough is obtained.

The doughs now remain in the containers on the bottom platform until they have completed one revolution, when they are ready to pass to the dough divider (Plate 6).

The feed is provided by the opening of the valve in the bottom of the fermentation pans, and again the surplus gas is removed and the dough stretched, but in order to ensure a regular continuous feed the dough now passes through a set of rollers fixed above the hopper of the divider, so that there is little possibility of air or gas pockets. Failure of supply of dough to maintain a regular feed to the divider can only take place from carelessness or a mechanical breakdown.

From the divider the pieces of dough pass through the usual handing up and intermediate proving plants and on to the moulders and into the final prover, being automatically greased and counted by means of a Selenium cell.

The oven is of the travelling plate type, and for the regular setting of the bread on the plate a special type of proving tray was designed which is most efficient and produces most regular results. It will be seen from Fig. 6 that the proving tray slides along rails at either side of the plate, so that transference on to the plate is accomplished without any handling.

The bread travels through the oven for 1¼ hours and then is automatically transferred to the cooling racks, situated on the floor below, so that cooling is carried out under the best conditions and most efficiently (Fig. 7). After cooling the bread is wrapped in the usual wax paper automatically.

Pan breads are also baked off in this oven, but special breads are baked in a battery of draw plate ovens, the doughs for which breads, such as various types of brown breads, Vienna, fancy milk fruit breads, and rolls, are made on another plant. At the present time there is no special dough conditioning room for these, since an auto-

Fig. 6.—**The Automatic Batch Bread Setting on Travelling Ovens. It will be seen that the proving tray slides along rails at either side of the plate.**

Fig. 7.—**The bread being delivered on travelling bands to an Automatic Cooler, where the cooling takes place most efficiently and under the best conditions.**

Fig. 8.—**The Issue Counter of the Ingredient Store, which has the tidy and cleanly appearance of a hospital.**

Fig. 9.—**The Home-Made Cake Department where all mixings are made on a small scale, no matter how great the number of orders.**

Fig. 10.—**Checking the temperature of the Patent Travelling Hot Plate which is gas fired. This travelling hot plate has been specially made to facilitate the production of potato scones, which are very popular in Ulster.**

matic system cannot be adopted because of the varying length of fermentation times.

Fig. 3 shows how troughs have been dispensed with and nickel dough containers suspended from overhead rails are employed. There is a hoist and other mechanism to facilitate the handling of these.

Confectionery Department

In the production of confectionery only the very best ingredients are used. Fig. 8 shows the store, which for tidiness and cleanliness more resembles a hospital than a confectionery raw materials storeroom. Only shell eggs, fresh creamery butter, fresh milk, and first quality other ingredients are in the store. There is no room for second-grade produce. As a result all the confectionery is not only good to gaze upon, but still better to eat.

Home-Made Cakes

A special staff is employed for this work. Fig. 9 shows this section of the production. All the mixings are on a small scale, and no matter how great the number of orders, the mixing unit will not be multiplied, but an extra mixing is made. Such procedure will strike many craftsmen as absurd, but one cannot disregard the very apparent fact—apparent it should be to all—that different results are always obtained with large batches than with small. Only by keeping to small unit mixes can the home-made flavour be retained.

Hot-Plate Goods

As in Scotland, so in Ulster there is a great demand for hot-plate goods, and one of the most popular lines in Belfast is the potato scone. So great is the production that a travelling hot plate has been made to facilitate production. On this plate (Fig. 10) all goods are perfectly baked and easily handled. The temperature is checked by means of a thermocouple, so that attaining of the correct temperature for each class of goods is no longer left to chance.

After having spent a considerable time in this bakery, as one leaves one is struck by the absence of fatigue as far as oneself is concerned but more particularly as shown in the faces of the workers themselves. This must be entirely due to the hygienic conditions of work, for everything, floors included, are kept exceptionally clean. A vacuum cleaning plant installed as a central unit is in operation on all floors daily. Thus an atmosphere as free from dust as is possible without a full air conditioning plant is obtained. The main factor in reducing fatigue is, however, the absence of noise. No heavy articles are moved on the floors; any moving equipment is mounted on rubber tyres; wherever possible, tins, baking sheets, and other articles which normally contribute to noise are moved by conveyors. If only more attention were paid in all factories to this elimination of noise, much unnecessary fatigue would be prevented.

Transport

Finally, in the distribution of their products a fine fleet of horse-drawn vans have formerly been used, but recently forty electric vans have been purchased and are being tried out in an endeavour to obtain more hygienic methods of delivery so that there is no possible means of contamination of the goods sold. In this way it is possible for the vanmen to be clean, efficient salesmen.

All transport is housed in a large separate building with repair and paint shops attached and provender stores for the horses. This is just another way of maintaining hygiene, for it is made much more difficult for vermin or flies from the stalls to gain direct access to the bakery without quite a long journey.

(*We are indebted to the Ormeau Bakery, Ltd., for permission to reproduce the illustrations given in this article.*)

MARMALADES AND PRESERVES BY MODERN METHODS

E. JACOBSEN describes the modern preparation of marmalades and preserves in a long and detailed article published in five parts in the *Braunschweigische Konserven-Zeitung* from March 11 to April 1. Following an introductory passage on the broad principles involved in marmalade and preserve manufacture, cooking processes in open, shut, and evacuated vessels are described. Sugar, glucose, consistency, the addition of pectin and colours are then considered, and observations on costing applied generally, and also to the different methods of steam raising, and factory layout and equipment are included. The author gives numerous practical recipes for the manufacture of different marmalades and preserves. These include apple marmalade (preserve and jam), pineapple preserve, apricot marmalade, and strawberry and raspberry marmalades and preserves. Special recipes, such as that for marmalades for diabetics, are given, and the preparation of plum jam is described at length.

FRUIT PRODUCTS RESEARCH

The Present Position at Long Ashton

By VERNON L. S. CHARLEY, B.Sc.

(Department of Fruit Products [including Cider], University of Bristol Agricultural and Horticultural Research Station, Long Ashton, Bristol.)

AT THE present time cider is undoubtedly the most important liquid fruit product made commercially, and it was largely for this reason that the Research Station at Long Ashton, as the home of the National Fruit and Cider Institute, was asked by the Ministry of Agriculture to undertake extensive investigations into the production of beverage products from other fruits grown in this country. The scientific study of cider at Long Ashton dates from 1903, when Professor B. T. P. Barker, M.A., the present Director of the Station, commenced to investigate some of the problems connected with farm cider-making. The results of this work were quickly seen to be of such significance that the scale of operation had to be greatly enlarged to make the experiments more adaptable for commercial needs, for the larger cider firms were by now making use of the results as they became available. Developments gradually occurred until now the Department is able to carry out experiments in a properly equipped factory on considerable bulks of cider being processed for commercial purposes.

During the war, the Director was instrumental in developing the cold SO_2 preservation process for fruit, and, through the Ministry of Food, commercial production of cider apple jelly was carried out both at Long Ashton itself and at other centres. The old army hut which served as a home for the evaporators has now been pressed into service to accommodate the small scale operations which will be discussed later in this article.

Disposal of Ungradable Fruit

In 1932 the question of food marketing methods was very much to the fore. Prominent amongst the foodstuffs for which drastic marketing schemes were proposed was the fruit crop of this country, and grading in some form was widely advocated as the first step towards better marketing conditions.

The problem that faced the fruit grower was that of disposing of his ungradable fruit at an economic rate. It was often hurled at his head that the mere removal of blemished fruits would automatically raise the value of the graded fruit to such an extent that the former type could just be discarded. But few growers would experiment on these lines. Grading was agreed to be a most desirable procedure, but some use must be found for the "throw-outs" before grading could be generally adopted throughout the country. It is obvious that better marketing schemes based on the stringent grading of fruit must be very widely adopted to have any appreciable effect on the consumer, and, with this in mind, coupled with the fruit grower's natural tendency to give the cold shoulder to grading for the above-mentioned reason, the Ministry of Agriculture decided to initiate some research work into the utilisation of ungradable and surplus fruits.

Consequently, the writer, who was then in charge of the scientific investigations being carried out at Long Ashton on cider and its by-products, was given this additional problem, and the preliminary experiments were commenced in 1932. The terms of reference for the initial stages of the work were to investigate, in a general way, the possibility of using surplus fruit for the production of edible or potable products—of course, excluding those already in common use, such as jam and canned fruit—and to determine which classes of products, or individual samples, deserved further and more detailed study.

The Pioneer Stage

Three years were given to this pioneering stage. In the short season available for the work a wide variety of products were made, and each year the previous results formed the basis for the ensuing season's programme. The experiments were considerably handicapped by the financial limitations caused by the reduction in Treasury grants to Research Stations, and only small-scale experiments were possible. But series of products were produced that gave every promise of being commercially capable of economic production, and thus the first stage of the work may now be considered as being completed.

The last few months has witnessed a remarkable display of interest in fruit products, largely on account of the publicity given to the recent experiments on the use of these fruit syrups in milk. Public imagination is easily stimulated, and here are all the elements needed for this purpose. Fresh milk with pure fruit juices, the health-giving properties of both types of food combined in one drink, the vitamin deficiencies of one constituent supplied by the other, are all points which may help to make the present boom in milk drinks exert a powerful stimulus on the production of fruit syrups. Some idea of the way in which the services of the writer have been sought by fruit growers and manufacturers can be gained from the following figures for requests for advice on various fruit products questions:

1932	25
1933	117
1934	280
1935	299
1935-6 (5 months only)	287

In view of the development of this keen interest in the work, it was decided to give an opportunity to all fruit growers and others to taste the various products and to discuss the general methods of manufacture. This "tasting day", to which reference has already been made in the Editorial columns of FOOD MANUFACTURE, took place on March 11, and over 120 visitors were welcomed, these coming from places as far apart as Berlin, Keswick, Cornwall and London. The exhibits were arranged in the laboratories, and a Milk Bar, run in conjunction with Mr. T. Elmslie-Cox, Organiser of the South-Western Area for the National Milk Publicity Council, was included. It is difficult to imagine a more valuable opportunity than was afforded on that day for the research workers to gain first-hand information of the views of the manufacturers on the products, views which eventually must be of vital importance if future work is to be guided along the most fruitful channels. Much of the discussion that follows is the outcome of frank exchange of views which took place on the "Open Day" as well as on numerous other occasions.

It is not intended to mention the products exhibited in detail, but rather to discuss each class of product from the point of view of its possibilities as a commercial article.

Fruit Juices

Two types of juice are possible. In the first place, the normal acidities (as citric acid) of the English soft fruits vary from 0·8 per cent. for strawberry, 1·0 to 2·0 per cent. for raspberry and gooseberry, to 2·0 to 3·0 per cent. for loganberry and black currant. Such juices, even if they could be kept for the requisite period, would be much too sharp for consumption as such, and would need dilution to approximately 0·4 to 0·7 per cent. of acid to be palatable. A serious difficulty in the way of keeping juices in a fresh condition for a period of at least 12 months is that of preventing fermentation. Pasteurisation should be avoided where possible, and the other alternatives are the Seitz-Bohi process, in which the juices are stored in enamelled steel vats and impregnated with CO_2 at a pressure of 120 lb. per square inch, or the storage of Seitz sterilised juices in sterile containers other than the above type. So far, apple juice only has been studied, and a large bulk of juice made in November, 1935, and sterilised by filtration, is still free from any fermentation after 5 months' storage in wooden casks, either treated with bituminous linings or merely sterilised with 100 per cent. SO_2. But the former process is expensive and the latter is definitely uncertain.

Fruit Syrups

The second means of producing fruit juices is through the intermediate conversion of juices into syrups in the fresh fruit season. The fruit flavour is retained and the dilution necessary to reduce the sweetness of the syrup to reasonable limits is also effective in removing the excess acidity. In fact, in the case of some heavy syrups made from the lower acid fruits it is sometimes necessary to add fruit acids to the syrup to give sufficient briskness to the ultimate drink.

Juices made from syrups vary in attractiveness according to the method of preservation and the variety of fruit used. The retention of the characteristic fruit flavour is greater with heavy syrups (60 per cent. sugar) in which no pasteurisation or SO_2 is used. But these heavy syrups produce beverages that are less intensely flavoured than drinks produced from lower sugar content syrups, on account of the lesser dilution involved both in adding the sugar to the fruit juice and in the final addition of water or soda water to break down the syrup. Consequently, two alternatives are available. In one case, a heavy syrup gives a fully characteristic fruit flavour, which, however, is not as prominent with some fruit as could be wished, whilst lower sugar content syrups (30 to 45 per cent. sugar) afford beverages which are distinguished by more marked flavours which are not always entirely true to that of the fresh fruit.

Loganberry syrup in both forms is excellent. The unique, subtle flavour of the fruit is retained by the syrup and the juice, and the latter is a splendid, high-class beverage. Blackcurrants and gooseberry syrups have produced beverages which have been considered to be acceptable to the consuming public on account of their superficial similarity to citrus products. The writer, however, is of the opinion that greater success will eventually result from investigations which are designed to discover products that will be distinctive, and are not obviously intended to be imitations of widely known beverages.

Table I. gives some data on the syrups included in the exhibit of fruit products at Long Ashton.

TABLE I.—FRUIT SYRUPS.

The syrups were prepared by the addition of cane sugar to the clear pulp-filtered juice expressed from the fruit after 2·6 days of fermentation. Except in the cases of Nos. 1, 4, 5, 6, 16 and 17, citric acid was added to all the syrups. Nos. 7, 8, 13, 15, were pasteurised at 165° F. for half an hour.

No.	*Fruit.*	*Date of Making.*	*Specific Gravit .*	*Sugar Per Cent.*	*Acidity as Citric Acid Per Cent.*	*Sulphur Dioxide (Parts per Million).*
1	Strawberry ...	1932	1·330	68	0·59	Nil
2	,, ...	1935	1·157	36	1·99	147
3	,, ...	1935	1·206	45	2·08	183
4	Raspberry ...	1932	1·320	65	0·84	Nil
5	,, ...	1934	1·304	63	0·47	,,
6	Blackcurrant ...	1932	1·307	62	1·31	,,
7	,, ...	1934	1·154	35	1·75	,,
8	,, ...	1934	1·222	48	1·04	,,
9	,, ...	1935	1·162	37	2·93	150
10	,, ...	1935	1·215	47	2·51	143
11	Loganberry ...	1935	1·167	38	2·40	174
12	,, ...	1935	1·211	46	2·72	139
13	Red Gooseberry	1934	1·218	47	2·66	Nil
14	,, ...	1934	1·315	64	1·36	,,
15	White gooseberry	1934	1·221	48	1·62	,,
16	Wortleberry ...	1935	1·289	60	0·39	,,
17	Youngberry ...	1935	1·280	59	0·39	,,

Apart from their use as bases for beverages, fruit syrups can be utilised in a variety of ways. They can be poured over breakfast cereals or cooked foods such as rice, sago, etc., or put into puddings; they may be incor-

porated with cream ices, or used for sundaes; they make delicious water ices and should find a market in the American bar and ice-cream trade. The use of syrups in milk bars is separately discussed later.

Concentrated Juices

Little can be said of the research work carried out on this subject, for only the preliminary stage has yet been reached. Great difficulty has been experienced in obtaining concentrates whose flavours compare at all favourably with those of products of similar gravity obtained by the addition of sugar to the fresh juice. When the question of relative intensity of flavour in concentrates and syrups is considered it will be seen that very appreciable differences should exist. In the case of a concentrated juice, the concentrate is merely brought back to its original volume by the addition of water, whereas in the case of a heavy syrup one volume of fresh juice yields two volumes of syrup, which eventually becomes twelve volumes of beverage. In the latter case, the original flavour is reduced to $\frac{1}{12}$ of its intensity, but in the concentrate no such excessive dilution occurs. But the scales are not entirely weighted against the syrup type of product. The acidity of the highly acid juices now under consideration increases as the evaporation *in vacuo* proceeds, and this acidity, even at the relatively low temperatures used, has a certain effect on the fruit flavour of the concentrate. Again, there is a definite loss of the more volatile flavouring materials, and their collection and return to the concentrate is not an easy matter. Despite the fact that evaporating tanks are now procurable to work under very high vacua, it seems probable that for products where the true fruit flavour is important, the more recent freezing process will be developed. A series of products made by the Krause-Linde process were tasted in Germany last autumn by a party of English cider-makers, and the retention of fresh fruit flavour was most satisfactory. The process has not been developed in this country on a commercial scale, but a report on the investigations that have been carried out at Long Ashton will be included in the Annual Report of the Station for 1935, which will be published in June.

Fruit Squashes

The successful production of squashes from surplus fruit is to a large extent a case of determining the correct size of mesh for sieving the various fruits. Seeds and skins must be removed, but the tissue of the soft fruits, such as strawberry, raspberry, and loganberry, becomes so finely disintegrated that it tends to become an amorphous sludge and is in no way comparable to the similar citrus products. The flavours of the squashes are remarkably good. Blackcurrant squash, over one year old, tasted exactly like the fresh uncooked fruit, and the strawberry beverage made in 1934 was eulogistically acclaimed by the visitors to the Department in the following season. As the process is entirely carried out in the cold, there is no possibility of cooked flavours of any description. Incidentally, the presence of any pasteurised taste in a squash is fatal to the fruit character.

Fruit Wines

The exhibit on the "Open Day" at Long Ashton included 12 wines which exemplified the wide variety of product that can be made. Strawberry fruit were converted both into heavy dessert wines with 9 per cent. alcohol and 15 per cent. residual sugar, and lighter dinner wines with 14 per cent. alcohol and 3 per cent. sugar. The flavours were reminiscent of sherry, and indeed a sample of the latter wine mentioned above was mistaken for sherry by a firm of French experts. Gooseberry wine promises to be of some significance; it is sharp and resembles hock. In the wines series again the loganberry product is unique. The fresh fruit flavour is retained to a remarkable degree, and the wine is most definitely unlike any other well-known type.

The conservative English consumers of wine are not readily seduced from the wine of the grape, and the comparative cheapness of fruit wines when compared with grape wines from the Continent is not such an important factor when the vast quantities of cheaply priced wines coming from the Colonies and Dominions are considered.

Fruit Liqueurs

Only very limited quantities of these have been made. The samples tasted on the "Open Day" were evidently regarded as in a class apart, for alone amongst the exhibits the supply failed to meet the demand. The general composition was based on that of the sweet liqueurs, such as Benedictine or Chartreuse. A completely new range of straight flavours and blends of flavours is possible, and the various combinations are almost unlimited. Two liqueurs were shown, loganberry and strawberry, with 30 per cent. alcohol. An enterprising visitor, experimenting with the two products on the "Open Day", discovered that a 60 : 40 mixture of the liqueurs in the order named above resulted in a product with a remarkably fine and intriguing character. The soft, mellow smoothness of the strawberry was, in some strange manner, associated with the brisk flavour of the loganberry, the combined flavours being well married and altogether delightful.

Fruit Brandies

Limitations in distilling apparatus have retarded the development of this section of the work. But sufficient work has already been done on cider brandy to class this product as of definite commercial importance.

Much remains to be learnt regarding the exact processing and maturing which will give the best results, but already some fine brandies have been produced. There is a considerable sale of fruit brandies such as kirsch and mirabelle (from cherry and plum) in America and on the Continent; in France cider brandy (Calvados) is a high-class product. At ceremonial banquets a small glass of Calvados is supposed to be taken straight off half-way through the meal. This is the celebrated "trou normand" (Norman nail), the function of which should be obvious when its position in the middle of a lavish meal is considered. Very large quantities of cider brandy are produced in America, and it would seem to provide a possible outlet for some of the surplus English apples.

FOOD and WAR

Correspondence on the Provision of Reserves for Emergency in Case of War

From MR. A. LL. MATTHISON

(President of the National Food Canning Council)

Food Storage a National Insurance

Mr. T. H. Fairbrother's article, "Are We Prepared?" in your April issue, is most timely and appropriate in the present state of international tension. It is to be hoped that our Government will immediately consider Mr. Fairbrother's suggestions and instruct the necessary department to investigate the matter of food storage in tins as a reserve in case of war. It is, of course, a big problem fraught with many difficulties, and the cost would probably run into millions, but they are not insurmountable. Necessity forced us to learn a great deal about production organisation and distribution during the Great War. We were caught unprepared then and had to make the best of a bad job. There can be no possible excuse to-day for such unpreparedness. Mr. Fairbrother refers principally to wheat storage. May I add to his suggestions as far as canned or preserved food is touched on?

The storage of canned foodstuffs such as meat, fish, peas, fruit, butter or substitutes, to mention only the leading nutritional items of dietary, would have to be distributed over a wide area and according to the density of the population. It could only be of the nature of an emergency ration, and probably only practicable for a short period. Assuming a quantity of five assorted cans of these foods per week (as an emergency ration) per head and a population of 50 millions, this would mean the purchase of 250 million tins as a week's ration for the nation. Four weeks would require 1,000 million tins, costing approximately £25,000,000. Truly a very large outlay, but a profitable one by reason of the extra productive labour required and the corresponding decrease in the "dole".

The dietary of these five tins, together with bread and potatoes, even in small quantities, would be far superior in food value and appetising qualities to what many of us subsisted on during the war. This is only a rough suggestion, but I submit that it is of great importance in proving that the Food Canning Industry of this country is one of national importance and most vital to the health and contentment of the community, particularly if we were ever again to be faced with the menace of war.

The cost and storage of 1,000 million tins of food would be a very small price to pay for a month's freedom from starvation rations, civil commotion, looting, anarchy, and a probably inglorious capitulation to an enemy nation or nations. It is easy to say "it can never happen here", but the sensible business man insures against fire and is happy to renew his policy year after year, however small the risk of his premises being burnt down. Mr. Fairbrother's Food Storage Scheme is one of national insurance, and I trust the Government will consider the advisability of paying the necessary premium for so vital a security. Moreover, unlike all other forms of insurance, the premium paid would still be the property of the insured and saleable at any moment, and at its original price in all probability. Obviously the stocks would be used or sold, and replaced annually to prevent any spoilage or possible deterioration.

I need not stress the great increase in productive employment which a National Food Storage Scheme would cause, but agriculture, coal-mining, iron and steel, machinery and transport would benefit considerably, in addition to many smaller industries.

Armaments become obsolete after a lapse of time and have to be scrapped, replaced, or refitted, which means continual wastage and loss, a form of insurance which necessitates the payment of a very heavy premium and one in which claims are never paid in full, if at all. Canned foodstuffs do not deteriorate, do not become obsolescent, or need to be replaced by something more up to date, more complicated, or more costly. They are standardised articles of nature, unalterable and constant in nutritive value. The fruits and vegetables cultivated by man, the meats from the cattle he rears, the fish he catches in the sea, are by modern scientific and hygiene methods stored in the hermetically sealed container, ready for his consumption in season and out of season. They are essentially the same in quality, taste, and food values as when in their unpreserved condition, except for the fact that they have been scientifically and correctly cooked and sterilised.

A scheme for national storage of preserved foods, whether in tins or other forms of container, should have the support, not only of those who think war possible, but of those who would like to see a revival in agriculture and the allied industries.

A. LL. MATTHISON
(*President*).

From MR. G. R. HARDING

(Managing Director of Maconochie Brothers, Ltd.)

Emergency Food Supplies

You may be interested to hear that I brought up this matter at a meeting of the London Chamber of Commerce held on the 8th of this month. The motion which I proposed—and which after undergoing some slight amendment was unanimously carried—was in the following form:

> "That the National Defences Committee be asked to consider and report on a proposal that steps should be taken forthwith by His Majesty's Government to ensure an adequate supply of wheat being stored in the country against possible eventualities, and that ample and fixed supplies of this and certain other essential articles of food—such as sugar, meat, and tea—be maintained at all times."

For your information, the Committee referred to is one composed of a number of eminent naval, military, and civil gentlemen and is presided over by Lord Desborough—who, incidentally, was present at the Council Meeting.

I am not too sanguine as to any speedy action resulting, but will make inquiry as to progress in a week or so's time.

In proposing the resolution I pointed out—

(1) That in spite of colossal expenditure British taxpayers will be asked to shoulder for increased armaments, no indication has been given by the Government as to what measures they are contemplating to secure our food supplies against the possibility of war breaking out.

(2) The Minister for Co-Ordination of Defence, at a meeting of the Conservative Parliamentary Agricultural Committee held at the House of Commons on the 7th of this month, pointed out that there was only ten days' reserve supply of wheat in the granaries of this country.

He emphasised that, while the statement of his duties in the White Paper was wide, he could not invade the responsibilities of other Ministers. Questions of agricultural policy were entirely for the Minister of Agriculture, although agricultural policy would naturally affect questions of defence.

Such a statement coming from a "new broom" is by no means reassuring, and rather suggests that this question is liable to become a shuttlecock to be tossed from one agile politician to another.

(3) That of all food supplies wheat is at once the most necessary to our needs, but is exceedingly difficult to transport in the event of war, on account of its bulk.

The activities of the Navy in the Great War were gravely hampered owing to the vital necessity of protecting our food ships, and upon more than one occasion, owing to the intensive submarine campaign, this country's food supplies were most seriously jeopardised.

Our Navy to-day is relatively in a far worse position than it was in 1914, and the country's vulnerability is, on the other hand, enormously increased.

(4) That modern methods of wheat storage are far more efficient than were ever dreamt of in past history, and we are quite capable of maintaining a minimum two years' supply.

Anything you can possibly do for the furtherance of the security of the country in regard to foodstuffs will, I am sure, be of incalculable benefit to the British nation, and in this respect I should like to say how much I enjoyed reading Mr. Fairbrother's article in this month's issue of FOOD MANUFACTURE.

G. R. HARDING
(*Managing Director*).

BRITISH CHEMICAL PLANT EXHIBITION, 1936

WITH the exception of one small stand, the whole of the space at the British Chemical Plant Exhibition, 1936, has now been taken. The Exhibition is being held at the Central Hall, Westminster, London, S.W. 1, at the same time and in the same building as the International Chemical Engineering Congress of the World Power Conference from June 22 to 27, 1936.

From the list of prominent firms which have taken space it will be clear at this early stage that the Exhibition will provide outstanding evidence of the capabilities and advances by British chemical plant manufacturers.

The broad outlines of the exhibits will be seen from the list of exhibitors. The exhibit, which is being organised by the Department of Scientific and Industrial Research to show the benefits of scientific research in industry, with special reference to chemical engineering, will illustrate activities covering a diversity of interests.

The subjects dealt with will include coal and its by-products, iron and steel, high pressure work, heat transmission, the efficiency of pipe-covering materials, corrosion resisting alloys, water purification and softening, a new ether extractor and its applications, heat treatment of flour, the effect of paint on illumination, the use of rubber and refractories in chemical engineering. A number of items exhibited will probably be illustrated by a series of short films.

The exhibit is a co-operative one, and a number of the research stations of the Department and Industrial Research Associations are contributing on a co-operative basis and not as individual bodies.

The Exhibition will be opened at 11 a.m. on Monday, June 22, 1936, in the Great Hall of the Central Hall. The official opening will be followed by an official tour of the Exhibition and an inaugural Luncheon at the Hotel Victoria, Northumberland Avenue. Invitations are also being extended to prominent delegates to the Congress from overseas, leading scientists, business men, and representatives of Government Departments.

PROPERTIES OF CRANBERRY PECTIN

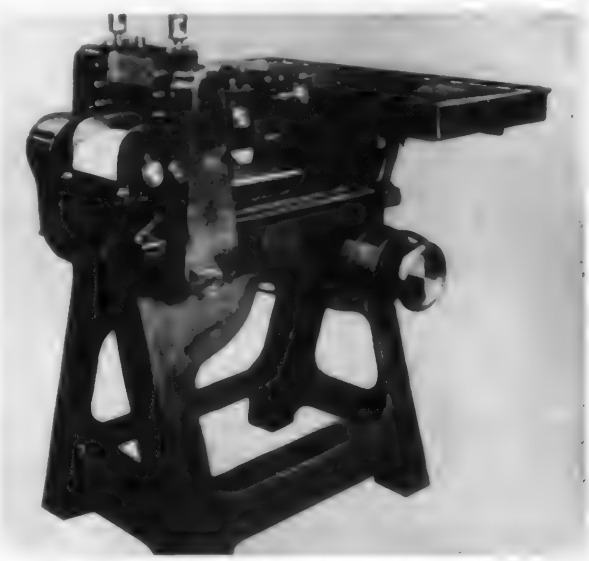
THE cranberry is interesting to jelly makers on account of the high viscosity of solutions made from its extracted pectin. Due mainly to the low *p*H of the fruit extract, jellies of low sugar content can be formed. Sixty-five per cent. sugar jellies cannot be made from the extracted juice; these can only be prepared by precipitating the pectin from the extract by means of alcohol, thus removing excess acid, and redissolving the pectin in water. Baker and Kneeland (*Ind. Eng. Chem.*, 1936, **28**, 372-5) have investigated the properties of precipitated cranberry pectin in order to arrive at a better understanding of the fundamentals of jelly making.

A correlation was found between the viscosity of heat-extracted cranberry juice and the strength of the jelly produced from these extracts. The maximum strength, x, for a jelly from an extracted cranberry juice of viscosity y may be expressed by the formula, $\log y = 0{\cdot}0052x + 0{\cdot}86$. Maximum strength of jellies appeared between 38 and 41 per cent. of sugar. The viscosities of 0·5 per cent. solutions of precipitated cranberry pectin were found to be an index of their sugar-supporting capacity for a given jelly strength. This index of sugar-supporting capacity was in closer agreement to apple pectin solution requirements than to solutions of lemon pectin, and these differences were considered to be due in part to the fruit salts present.

NEW SYRUPPED PEEL CUTTING MACHINE

WILLIAM BRIERLEY, COLLIER AND HARTLEY, LTD., have just introduced a new cutting machine for drained orange and lemon peel—*i.e.*, syrupped peel. Among the advantages of the machine is the incorporation of an automatic conveyor feed. The peel caps are placed on a travelling band and go automatically through the cutting head. The cutting action is clean, and the production of mush has been cut down to a minimum. In fact, at the end of eight hours' work it is said that the amount of mush accumulated can be held in one hand.

The syrupped peel is not subjected to the pressing action usually employed in this type of machine, so that the syrup is not exuded, and consequently the peel is heavier and has good keeping properties. Further, the cutting action enables the softer caps to be dealt with, which cannot be cut satisfactorily on the plunger type machine. The machine is said to give a high output and can be supplied either with a pulley drive or with direct coupled motor.



New Type of Drained Peel Cutting Machine.

INDUSTRIAL NEWS

Sir Robert Mond Honoured

The Society of Chemical Industry, which awards its "Messel" Medal every alternate year to a scientist who has attained eminence in applied chemistry, has this year chosen Sir Robert Mond for the distinction.

Sir Robert has been and is still associated with a number of important firms in the chemical industry. He has done a great deal of original work, and was at one time associated with Lord Kelvin.

In having been awarded the "Messel" Medal, one of the most notable distinctions that can fall to a chemist, Sir Robert is sustaining a family reputation, for his father, Ludwig Mond, was famous for his work in the chemical industry, especially in connection with the work of Brunner, Mond and Co.

Sir Robert Mond is a native of Farnworth in Lancashire and was trained at Cambridge, Edinburgh, and Zurich. In addition to his many directorships he has been President or Fellow of a score or more learned societies and has gained a wide reputation as an Egyptologist.

Tour of Mr. G. Thomeson of Hunter-Penrose Ltd.

Mr. Thomason is very shortly making an extensive tour of New Zealand and Australia in order to meet clients interested in printing, box and container making, and special lines of paper converting, such as the manufacture of embossed paper seals. He anticipates arriving at Christchurch, New Zealand, on May 9 next, where his address will be c/o Messrs. P. S. Witson and Co., Ltd., 178 Manchester Street, Christchurch.

Chemical Engineering Congress

The organisers of the Chemical Congress of the World Power Conference, which is to be held at the Central Hall, Westminster, from June 22-27, 1936, are raising a guarantee fund to cover the expenses and the sum aimed at is £600. A good start has been made and already £400 has been paid or promised. All contributions, whatever their magnitude, will be gratefully received by the British Chemical Plant Manufacturers' Association, 166, Piccadilly, W.1.

(Photo by Claude Harris.

Sir Francis Humphrys, who is to be the chairman of the Corporation formed by the amalgamation of the companies manufacturing sugar from beet.

Chairman of the Sugar Corporation

The Secretary to the Ministry of Agriculture has announced that Sir Francis Humphrys is to be the chairman of the corporation formed by the amalgamation of the companies manufacturing sugar from beet. Sir Francis was chairman of the committee which made investigations preparatory to the Sugar Reorganisation Bill.

Dr. Earle Page in London

Australia's Deputy Prime Minister, Dr. Earle Page, is at present visiting this country in order to discuss with British Ministers the possibilities of improved markets for Australian products. The particular products with which his mission is concerned are butter, meat, fruit, and sugar, and he is specially interested in the form which may be taken by British trade treaties with foreign countries which produce these goods.

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Mr. William Pender, of the firm of William Pender, Ltd., food manufacturers, Silvermills, Edinburgh, has been appointed by the Ministry of Labour as a representative of the employers on the Sugar, Confectionery, and Food Preserving Trade Board, Great Britain.

New Chairman of Food Council

Mr. Geoffrey K. Peto, C.B.E., has been appointed Chairman of the Food Council and of the Consumers' Committees for Great Britain and England, in succession to Sir Geoffrey Corbett, K.B.E., C.I.E., who resigned the chairmanship of those bodies last year on his appointment as Adviser to the Egyptian Ministry of Commerce. Mr. F. W. Mackinney, C.B.E., will continue to act as Vice-Chairman of the Food Council.

Scottish Bakers' Exhibition

The British canning industry had its first national public exhibition in Scotland recently when the Metal Box Co., Ltd., took a stand at the Scottish Bakers', Grocers', Confectioners', and Allied Trades' Exhibition. The lines of the exhibit followed more or less those on which the Metal Box Co., Ltd., carried out similar displays during 1935 at Charing Cross Underground station, at Manchester, and at the Grocers' Exhibition at the Royal Agricultural Hall.

London Baking Trade Exhibition

The fourteenth London Baking Trade Exhibition, organised by the London Master Bakers' Protection Society, was opened at the Royal Horticultural Hall on March 24 by the Master of the Worshipful Company of Bakers, Mr. H. Balls. There were over 4,500 entries in 96 classes, including bread, confectionery, and decorated cakes. There was every indication that the show would prove a financial success as in previous years.

The Bulletin of the Imperial Institute

The Imperial Institute have now decided to publish the Bulletin themselves, with effect from the January-March number. The general format is unchanged, but the scope of the contents is extended. By this means it is hoped that the Bulletin will appeal to a wider circle of readers and with the same end in view the price has been reduced to 2s. 6d. per number (annual subscription 10s.).

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The Corporation has recently moved to Leeds, its new address being 16, King Street Chambers, Wellington Street, Leeds 1.

Food Group's Visit to Holland

The following programme for the visit to Holland in May of the Food Group of the Society of Chemical Industry has been arranged:

Thursday, May 7.—Visit Messrs. Unilever's Oil and Margarine Works at Rotterdam. Visit Messrs. Hero's Fruit and Vegetable Preserving Factory at Breda.

Friday, May 8.—Visit Messrs. Organon's Pharmaceutical Preparation Factory at Oss, and/or Messrs. Zwanenberg's Preserved Meat Factory at Oss. Visit Messrs. de Gruyter's Food Products Factory at s'Hertogenbosch.

Saturday, May 9.—Visit the South Holland Brewery at The Hague and the seaside resort of Scheveningen. Reception at tea by the Dutch Chemical Society.

Sunday, May 10.—Motor coach tour of the bulb field districts. Motor coach tour of Amsterdam.

Monday, May 11.—As guests of Messrs. Hollandia the party will travel by motor coach: (*a*) Across the Zuiderzee-dijk to a condensed milk factory at Bolsward, Friesland. (*b*) To a cheese factory at Nijega, Friesland. (*c*) To a model farm in the new Wieringermeer polder.

Tuesday, May 12.—Visit to the Municipal Laboratories, Amsterdam. Visit to the yeast factory of Messrs. Nederlandsche Gist-en-Spiritusfabriek.

International Congress for Microbiology

The second international Congress for Microbiology will be opened in London on July 25. The subjects under discussion will include bacteria in milk and in perishable fresh and canned foods. The headquarters of the Congress will be University College, Gower Street, additional accommodation being provided at the London School of Hygiene and Tropical Medicine and the Wellcome Research Institution. We shall publish further details of arrangements in our next issue.

Mr. Charles Downs, whose death is announced on the next page.

Two New Vegetable Fats

"Covo," made by the Covo Refining Co., Ltd., Unilever House, London, is a new vegetable fat for biscuit makers. It is claimed to be 100 per cent. vegetable fat, is double refined, is devoid of free fatty acids, and is tasteless and odourless. It has a smooth and plastic texture and is workable over a wide range of temperatures without pre-treatment, it has also a maximum shortening value. It is remarkably stable, thus giving it a property of resisting oxidation and rancidity.

"Spry" is a new domestic cooking fat which has been recently introduced by R. S. Hudson, Ltd., Unilever House, London. This product is also a pure all-vegetable fat, and has properties similar to those of "Covo". The use of "Spry" in frying, pastry-, cake-, and pudding-making, etc., is said to give much more satisfactory results than those obtained by other fats and shortenings at present available.

Cooking by Alternating Current

A new system of cooking by alternating current was demonstrated at the Leipzig Fair. In principle the system consists of passing an alternating current through the food substance itself whereby its temperature is raised owing to its natural resistance. In a test, the ends of a curved sausage about 18 in. long by 2 in. in diameter were placed in cups, acting as electrodes, and enclosed in a bakelite container. The current was switched on and the cooking was completed in two minutes.

New Cereal Breakfast Food

A flake cereal breakfast food made wholly from native Irish wheat, flavoured with malt and sugar, has been put on the market by Brown and Polson, Ltd. Irish wheat has proved most suitable for the flakes, being low in gluten, and so producing even particles. The product is marketed in 10-oz. packets, which are being sold at the same price as the 8-oz. American packs.

Utilisation of By-Products

The Farmers' Marketing and Supply Co., Ltd., of 59, Mark Lane, E.C. 3, has been formed to convert the waste materials of the food industry into valuable feeding stuffs, and a distributive organisation has been set up for the sale of these products to farmers and cattle breeders. Some of the waste materials which are dealt with are skim milk, potatoes which do not come up to the standards of the Potato Marketing Board, and pea haulm and pods from canneries.

A group of Jam Pans made of Henry Wiggins and Co.'s nickel.

New Bottle Washing Machine

A. Graham and Co. Ltd., have designed a new machine for washing bottles, jam jars, etc., called the Jubilee Bottle and Crate Washer. The machine is equipped with powerful pumps which provide the pressure for washing the bottles, the process consisting of pre-rinse, solution, hot water, and steam treatment. It can be arranged to cool the bottles for immediate filling if required. A rotary bottle washer is made by the company and this is also suitable for the cleansing of jam jars.

New Meltis "Sionon" Chocolate

Sorbitol (Sionon) is a carbohydrate having a calorific value similar to that of glucose and, according to a report published in the *Lancet*, can safely be used as a sweetening agent for diabetics. Messrs. Meltis have blended a proportion of "Sionon" with Meltis chocolate and have obtained a product which is most palatable and which can be eaten with safety and benefit by diabetic sufferers.

New Gooseberry Snibbing Machine

A new machine for topping and tailing gooseberries for bottling and jam-making purposes has been put on the market by William Brierly, Collier and Hartley, Ltd. With this machine the fruit can be dealt with in large quantities as it is received from the grower, and can be delivered to the pan ready for the preserving process with complete elimination of labour. One bushel of

fruit can be snuffed, tailed, and cleaned in one minute, or at the rate of over 1 ton an hour.

General Jam Making Machinery

The Lazenby and Ridgwell Canning Machinery Co., Ltd., manufacture a large range of machinery suitable for use in the preparation of jam. The range includes several types of fruit grading and sorting machinery, machines for halving and stoning, washing, dicing and slicing, peeling and coring, pulping, pricking, and cherry pitting. All these machines are described and illustrated in a series of leaflets issued by the company.

Vitamin Institute for Leningrad

Biscuits, sweets, jams, culinary oils, and non-alcoholic drinks are to be scientifically impregnated with vitamins in the Soviet Union.

As a result of the successful research work of food scientists into the production of vitamins on a factory basis, a permanent Institute of Vitamin Research has been established in Leningrad. It will carry out investigations on behalf of the whole Soviet food industry.

Working in close co-operation with the Institute is a large vitamin-producing factory, whose scope, it is stated, will shortly be developed into an All-Union Combine for the manufacture of vitamins.

Before the Institute was finally established, methods had already been perfected for the vitaminisation of various forms of food and drink which were deficient in this respect. But it is only now that such methods can be applied on an industrial scale.

The Health Congress

The arrangements for the Health Congress, which is to be held by the Royal Sanitary Institute at Southport from July 6 to 11 next, include discussions on Food Package and the Consumer, Abattoirs and Meat Inspection, the Accredited Milk Scheme and Milk Distribution and its Problems.

OBITUARY NOTICES

Mr. Charles Downs

We regret to announce the death of Mr. Charles Downs at the age of 70. He was managing director of Rose, Downs and Thompson, Ltd., of Hull, well-known engineers and specialists in oil mill machinery, edible oil refineries, fish meal and oil plant, etc. It was principally through the enterprise and initiative of Mr. Downs that the firm grew from small beginnings to one of worldwide reputation.

Sir Joseph E. Petavel, F.R.S.

We regret to announce the death of Sir Joseph E. Petavel, D.Sc., F.R.S., on March 31 at Teddington. He was appointed Professor of Engineering at Manchester University in 1908 and joined the General Board of the National Physical Laboratory in 1911, becoming Director in 1919, which latter post he held until his death. He has served on numerous Government and other committees and was an engineer and a physicist of wide reputation.

A "Pfaudler" Glass-Lined Vacuum Pan with a "Pfaudler" Jacketed Pre-heater on the left.

TRADE LITERATURE RECEIVED

Jam Vacuum Pans

Enamelled Metal Products Corporation, Ltd., have issued a new catalogue describing their Pfaudler glass-lined equipment. Among the equipment available are Pfaudler vacuum pans which are lined with acid-resisting glass enamel fused into open-hearth steel of such thickness as to withstand the collapsing pressure of a perfect vacuum. All are furnished with a sampler which permits the withdrawal of samples from the vacuum pan without interrupting its operation. It is also advantageous in many instances to employ a jacketed glass-lined open mixing tank in conjunction with the vacuum pan, so that while one batch of jam is being vacuum processed the next may be prepared and pre-heated.

Malleable Fittings

The catalogue of malleable fittings issued by Walworth, Ltd., includes a description of their new round bead taper thread malleable fittings. The following advantages are claimed for these new fittings: (1) a clearance is provided at the back of the thread, (2) the thread does not cut into the wall, (3) the round bead prevents distortion, (4) the threads are chamfered, and (5) conform to British Standard Specifications.

Sugar—From Grower to Consumer

We have received from Tate and Lyle, Ltd., a copy of their rewritten and modernised handbook, *Sugar—From the Grower to the Consumer*, which they produce for the benefit of teachers in schools and colleges.

The book, which is printed on art paper and is profusely illustrated, contains chapters on Sugar, Cane Sugar, Beet Sugar, Raw Sugar, Refining, Golden Syrup, Scientific Considerations, Carbohydrates, Brown and White Sugar, Cane and Beet Sugar, and the Sweetness of Refined Sugars.

There is an extremely interesting Flow Diagram which shows the sequence of operation in sugar refining from the raw sugars to the finished product.

COSTING in the Jam & Allied Industries

By F. S. WILSON, A.C.W.A., F.R.Econ.S.

This article is being published in two parts. The second and concluding part, which deals with production planning, wages and the recovery of costs, will follow in the June number.

IT IS evident that the jam and its allied industries in this country are suffering in some degree from the fact that many of its manufacturers have no reliable costing system to guide them in fixing their selling prices and in making other important decisions. Not only does this apply to many of the small manufacturers, but also to some of the larger and better known firms. The omission is perhaps understandable but not excusable when one realises that until quite recently it was usual for profits to be made in these industries. Manufacturers only concerned themselves with the final trading results of the year, and if the blend of business produced an apparently satisfactory profit they were happy. Individual costs and their effects on the profits were never considered, with the result that unprofitable lines were probably concentrated upon from a sales point of view more than some of the profitable ones.

Like most industries, the jam and its allied industries have felt the effects of world conditions; less money has been available for spending in many homes, tastes have changed, alternatives have been found for the products of these industries, and manufacturers have been faced with reduced sales at lower prices. This should have been the signal for unstinted co-operation amongst member firms in the industries in order to combat the external forces and to arrive at a general basis for profitable trading. But, as so often happens, the manufacturers as a whole preferred to rely upon their own judgment and to devise means and ways of improving their sales and profit and loss accounts by themselves rather than by united efforts. It must be mentioned, however, that the Food Manufacturers' Federation and the Ministry of Agriculture have made valiant attempts to assist the industries from time to time, and that the Food Manufacturers' Federation are now meeting with more success in their good work.

Those firms which boast of a costing system probably have nothing more than an estimating department, which in many cases is an offspring of the accountant's department. How many manufacturers in the jam and allied industries can honestly say that they know what their products are costing them to buy, manufacture, distribute and sell—and know what effect individual products in different packs have on their trading results? Very few could answer in the affirmative with any degree of accuracy. It is realised, of course, that these industries consist of firms who only concentrate on a local area and of larger firms who have a national distribution. The smaller manufacturers cannot afford a separate department for operating a costing system, but, nevertheless, the system can and should be introduced in some form so that its many advantages can be obtained.

Why have a Costing System?

Briefly the reasons why a costing system should be installed are as follows:

1. It illustrates the efficient working of the business by ascertaining labour and material costs and losses in all sections of the business.
2. It determines the expenditure necessary under certain conditions—*i.e.*, assists in budgetary control.
3. It enables comparisons to be made between estimates and actual costs and acts as a basis for more accurate estimating in the future.
4. It illustrates the margins contributed by each line.
5. It enables selling prices to be fixed in advance with confidence.

Cost finding is really quite simple if the fundamental principles are grasped and common sense is used in analysing expenditure, but, unfortunately, many manufacturers think that they know what costing means, whereas they merely juggle with figures to suit their own methods of reasoning. Only a few years ago, when a costing system was installed in one jam and fruit bottling concern, the managing director, who had previously fixed prices without knowledge of any costs, said to the cost accountant, "You cannot charge as much factory overhead expenses to bottled gooseberries as you can charge to damsons—the line won't bear it". Actually the factory expenses were rather more on gooseberries than on damsons, but because the selling prices of gooseberries were at such an uneconomic level this managing director had misled himself by believing that a lower priced article had to be charged with less manufacturing expense. Whether or not bottled gooseberries should be sold at a loss as a sales aid for other and more remunerative lines is another question, but this simple illustration of misguided judgment proves how necessary it is to know the facts before making decisions.

Uniformity throughout Industry is Desirable

If the jam and its allied industries could agree upon a uniform costing system, a big advance would be made towards stability in the trade, because competitors' prices would be determined on the same basic principles, and this should result in the survival of the efficient firms and likewise the elimination of the uneconomic units. Of course, certain elements of cost will always vary between firms in the same industry—*e.g.*, delivery charges, overhead expenses, selling expenses, and raw material prices. But whereas one firm may be situated near the raw material supplies and thereby reap the benefit of cheap

and quick supplies, another firm may manufacture in a populous area and gain by a saving in delivery charges and selling expenses. But the principles of cost allocation should be common to all.

The Main Cost Divisions

Actually the whole expenditure can be dissected into seven main divisions:

1. Raw materials.
2. Packing materials.
3. Labour.
4. Factory overhead expenses.
5. Distribution.
6. Selling expenses.
7. Capital expenditure.

The last item—*i.e.*, capital expenditure, which consists of additional plant, machinery, and buildings—must not be included in the costs of manufacturing and selling, but should be treated as an addition to the company's assets. Depreciation of these assets does, however, enter into the costs as an overhead expense. The raw materials consist of fruit, sugar, pulps, pectin, acids, and other ingredients, whereas packing materials comprise jars, bottles, tins, labels, cases, and other materials which are used to convey the raw materials from factory to consumer. Labour must be divided into two classes—*i.e.*, direct and indirect. The former represent the wages paid to operators who are directly engaged in the manufacture of the firm's products, while the latter represent auxiliary workers such as cleaners, gatekeepers, nightwatchmen, factory clerical labour, internal transport, etc.

The raw and packing materials and direct labour costs comprise the prime cost of production, and every item within this category can definitely be charged to the specific products. Factory costs which cannot be charged to any specific product are known as overhead expenses and consist of indirect wages, works salaries, repairs and maintenance to plant and buildings, fuel, insurances, depreciation, rates and taxes, etc. These expenses are analysed to departments by various methods and finally recovered on the production as an additional item to the prime cost of manufacture. It will be noticed that these overhead expenses can be further dissected into two categories:

1. Those which vary with an increase or decrease in production and can be described as variable expenses—*e.g.*, power for operating plant and machinery.
2. Those which bear no relation to the volume of production—*i.e.*, fixed expenses (*e.g.*, depreciation, rates and taxes).

This dissection between fixed and variable expenses must not be overlooked, particularly when quoting for special tenders, because if additional business is executed at prices which cover the variable costs it contributes towards the fixed charges of the company and is thereby considered profitable. On the other hand, it should be realised that the total costs must be covered by the normal production if no loss is to be sustained on the year's trading.

Distribution expenses cover those items which are incurred after the manufactured goods have been sent to the finished goods store and to the time when they are delivered to the wholesale or retail customer—*i.e.*, delivery charges and depot rent, etc. Selling expenses include travellers' salaries and expenses, demonstrations, advertising, and other expenses such as circulars to customers and display materials.

Regular Costing Periods

The costs should be compiled at regular intervals in order that the management can visualise and control the trend of events, and it is suggested that monthly or four-weekly costing periods be instituted. If the business manufactures jams, pulps, bottled and canned fruits, the periodical cost returns should be arranged so that the cost of each section is shown in addition to the total costs—*i.e.*, every item should be departmentalised. The report could then be drawn up to show the cost per cwt. (or any other suitable unit) of raw and packing materials, direct labour, variable and fixed factory overhead expenses, distribution and selling expenses, together with the outputs and sales of the various departments. This report should also show the comparative result of the previous month, the accumulative monthly results to date, and the result for the same period during the previous year. If the stocks are valued monthly it is quite a simple matter to arrive at the approximate profit or loss made in the period under review.

Stores Accounting

In order to control the cost of materials, careful records should be kept of the weights consumed, together with the corresponding outputs of finished goods obtained therefrom—*e.g.*, the daily weights of fruits purchased should be compiled with the weights bottled, jammed, or pulped, in order to track down leakages such as overweights or excessive rejections of fruit into pulp making. The consumption of sugar and pectin should also be determined and added to the fruit weights to obtain the actual weight produced. Daily records carefully compiled and intelligently absorbed by the management would have surprising results on the costs which are controlled by the management.

(*To be continued.*)

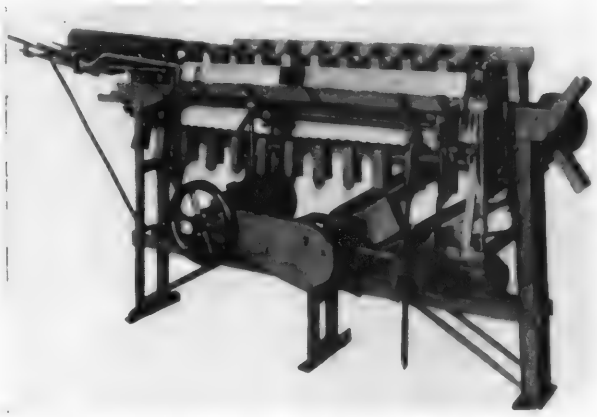
NEW PLANT

R. Moakes, Ltd., Plumstead, have ordered plant from J. and E. Hall, Ltd., including a high-speed compressor, to deal with extensions to their ice-cream factory. It is of interest to note that this new plant will comprise the third installation to be supplied by J. and E. Hall, Ltd., to Messrs. Moakes, and will be working with a smaller machine of the vertical enclosed type supplied in 1926.

NEW BOTTLE AGITATOR

A NEW bottle agitator, simple in operation and occupying only a small space, has been manufactured by the Purdy Patent Machinery Co., Ltd. The machine as shown has an intake arrangement whereby the bottles are placed on a guide rail, from which they are automatically taken by conveyor and carried through the machine, during which time they are in a state of constant agitation. At the end of the conveyor an automatic discharge mechanism is provided which brings the bottles to an upright position in order to deliver them to the intake conveyor of the labelling machine.

While this machine was designed originally for the purpose of agitating mineral water bottles in order to ensure proper mixing of the syrup content, it could, of course, be adapted to other requirements of similar nature.



The New Bottle Agitator of the Purdy Patent Machinery Co., Ltd.

RAT POISONS

EVERYBODY involved in the manufacture of foodstuffs is, by this time, sufficiently acquainted with the ravages and dangers attendant on the activities of rodents to be interested in any methods that have been developed for the extermination of these pests. A technical discussion on poisons for rodents was held recently at the College of the Pharmaceutical Society under the auspices of the University of London Animal Welfare Society. The object of the discussion was to explore the possibility of selecting or devising poisons for rats and other rodents, which would cause as little suffering as possible. One of the outcomes of the discussion led to the conclusion that of all poisons red squill was the most available and least inhumane of the poisons that could be used effectively. It is specific for rats, more toxic for the females than the males (which is a very useful property), and has very little effect on man or his friends the dog and cat.

For fumigation of burrows and subterraneous passages under warehouses it was pointed out that hydrocyanic acid is the most rapidly acting poison known, but we have had experience of the practical difficulties of getting the gas into all the retreats and backwaters of the rodents' domiciles in sufficient concentration to be effective and also the further difficulty of removing all traces of the gas when fumigation is over. Prussic acid is very toxic to human beings and should only be used in special circumstances under the control of experts thoroughly conversant with its effects. Some interesting points were raised on other methods of combating the rat menace—apart from poison—the rat-proofing of premises, elimination of nesting sites and supplies of food and water. Some authorities maintain that traps and poison baits are relatively inefficient, and there does not seem to be widespread confidence in bacterial poisons. One interesting fact seems to be that the average rat has an extremely high intelligence, and that being so, a person of more than average intelligence is required to catch him.

BOOK REVIEW

Food Industries Manual

A VERY rare and precious book has come into my hands for the first time. I do not know whether I can blame the publishers or take myself to task for the fact that I have not seen it before.

When I refer to an encyclopædia I feel I am perhaps not using the right word to bring this book to the favourable notice of those people who have not already seen it.

One remembers the story of the vicar who lent his parishioner a dictionary, and when it was returned the vicar asked if he had found it useful. The parishioner said he did not read it with any great enjoyment because it changed the subject so frequently. That is perhaps why so many of us do not spend our hard-earned brass on the purchase of encyclopædias. They are very valuable, but much of the knowledge in them is to a very great proportion only academic to most of us.

An encyclopædia of one's own industry, however, is a very different affair, and this is exactly what the *Food Industries Manual* is. I am amazed that such a thing does not exist in every other industry. I was also amazed to find that the book was not a directory or a re-hash of commercial announcements written into editorial form. This I fully expected it to be, and I could not suppress my excitement and interest when I found out that the book actually was apparently specially compiled matter by men who obviously know their subject.

The book is divided into sections which represent the broad divisions of the food industry. That on Cereals includes wheat, milling, flour and baking, and is compiled by no less an authority than T. H. Fairbrother. Sugar Confectionery, Jams and Jellies is compiled by J. Valentine Backes, Canning by Mr. F. Hirst and Mr. W. B. Adam, both of the Campden Research Station, Meat Products by that well-known expert (late of Poulton and Noel, Ltd.), Mr. A. Samson, who is now doing so well as a consultant. The other sections are Dairying by Dr. A. E. Ottiker and Mr. S. A. Wilcox, and Packaging and Cold Storage by unnamed compilers.

To nibble in the lightest way at my own words, I do think the section on Packing left a slight impression that in certain places perhaps some of the manufacturers' own literature had been used, but I almost think it is unfair of me to mention this because of the excellence of the other sections.

In my opinion it is the "number one" book for the laboratory of any chemist and technician who is in any way engaged with edible products, and such a one should congratulate himself that it can be purchased at the low price of 10s.

O. B.

Food Industries Manual. Pp. 448. 8¼″ × 11″. *Profusely illustrated. Cloth bound. General Editors, H. B. Cronshaw, B.A., Ph.D., A.I.C., and G. W. Lacey, B.Sc., A.I.C. Leonard Hill Limited*

The PASTEURISATION of MILK

A Vigorous Examination of the Essential Value of Pasteurisation of Milk

By RALPH G. HARRY, A.I.C., F.R.M.S.

The Legal Definition of Pasteurisation[1]

PASTEURISATION IS defined in the Milk (Special Designations) Order, 1923 (made under Section 3 of the Milk and Dairies Amendment Act, 1922) as the retention of the milk at a temperature of not less than 145° F. and not more than 150° F. for at least half an hour, and its cooling immediately afterwards to a temperature of not more than 55° F. Every particle of milk must be treated in the manner prescribed in the order, and these requirements can only be met with certainty in what is known as the "holder method", by which the whole of the milk is retained at the required temperature for the required time.

The Prevalence of Infection Due to Milk

According to a recent report,[2] it is estimated that about 40 per cent. of the cows in this country are infected with the tubercle bacillus, and careful research has shown that about 4 per cent. of the people suffering from tuberculosis of the lungs have been infected with bacillus of bovine origin. About 50 per cent. and 85 per cent. respectively of people suffering from tuberculosis of the bones and of the lymphatic glands have been likewise infected, and, considering the fact that living tubercle bacilli can be detected in some 6 to 7 per cent. of the samples of milk submitted for investigation, this is not to be wondered at. There is little doubt that if the true facts were known to the public they would demand that more effective measures should be enforced. Kayne[3] has recently drawn attention to the fact that by the ordinary veterinary inspection of cows it is often not possible to decide whether a tuberculin positive cow has active disease or not, and that in one case 1·5 per cent. of the samples of milk from clinically non-tubercular cows contained live tubercle bacilli. Further, the practice of mixing the milk from various herds raises the percentage of contaminated milk considerably, and 25 to 50 per cent. of bulked milks were found to contain the live bacilli.

What is the result of all this? Human tuberculosis of bovine origin is responsible for about 2,000 deaths a year, whilst at least 4,000 fresh cases of infection due to bovine sources occur annually. Expenditure on sanatorium treatment alone must amount to at least £500,000 per annum, and this figure does not adequately indicate the extent of suffering and deformity in young children.

Undulant Fever

This disease has become of increasing importance in the U.S.A. In 1933, 255 cases of Undulant Fever were reported in New York State.[4] Nearly all of the cases were attributed to raw milk from herds infected with Bang's disease. During the same year the U.S. Public Health Service recorded 1,659 cases of Undulant Fever, and it was concluded that even this figure represented only a fraction of the actual infection. Attention is drawn to the increase in such cases in this country by Eye in the 115th Huntarian Oration,[5] in which it is stated that Undulant Fever in its typical form is an acute or sub-acute infective fever, characterised by attacks of notable pyrexia alternating with periods of apyrexia, roughly of equal length. The average duration of the disease is from 90 to 150 days, but occasionally extends over 12 to 15 months.

Contagious Abortion exists all over England, and last year it was estimated that 20 per cent. of our cows were infected. Apart from laboratory infection, there had been little evidence of Undulant Fever in this country until recently, when several cases have been recorded, probably due to infection with Abortus. Dalrymple-Champneys, who has investigated the subject extensively, considers that Undulant Fever is undoubtedly on the increase in England, and has collected more than 60 cases during the past few years.

Other Infections

An examination of the following 436 outbreaks recorded during the years 1924-1933 by the United States Public health authorities provides some idea of the relative incidence of various types of other infections:[6]

	Cases.
Typhoid	286
Paratyphoid A	4
Paratyphoid B	6
Diphtheria	11
Septic Sore Throat	51
Scarlet Fever	50
Miscellaneous	28

These figures, which do not include intestinal disturbances of children, are believed to be only a portion of outbreaks due to actual milk infection, but unrecognised as such. In our own country an epidemic of sore throat at Brighton some few years ago, in which there were 7 fatalities, was traced to milk.[7]

Does Pasteurisation Render Milk "Safe"?

When properly carried out, pasteurisation is effective. B. Tuberculosis, B. Diphtheriæ, B. Dysentericus, B. Typhosus, and other organisms of the typhoid-paratyphoid group, together with the virus of foot and mouth

disease, are destroyed.[8] The following are some of the thermal death points of common bacteria, together with the time necessary to ensure their destruction:[9]

Typhoid bacilli ..	140° F. for 2 minutes
Dysentery	140° F. ,, 10 ,,
Diphtheriæ	140° F. ,, 1 ,,
B. Melitensis and B. Abortus	140° F. ,, 1 ,,
Mastitis Streptococci ..	130°-135° F. for 1 minute
B. Tuberculosis ..	140° F. for 20 minutes or 158° F. for 5 minutes

Does Pasteurisation Affect the Nutritive Properties of Milk?

Pasteurisation does not cause the soluble calcium and magnesium phosphates to separate out and has only a slight effect on the enzymes. There is no appreciable change in the Milk Proteins.[8] Vitamin A is not influenced, and there is no evidence to show that the proportion of Vitamin B_1 is reduced. Vitamin B_2 is heat tolerant, and there is not evidence to show that Vitamins D and E are appreciably influenced. Vitamin C, on the other hand, is destroyed to a greater or less extent, depending upon the degree of oxidation, which is accelerated by the catalytic action of certain metals, notably Copper. Aluminium and Nickel have little or no catalytic action.[9]

The normal prophylactic requirements of Ascorbic Acid (crystalline Vitamin C) for infants is about 15 mgm. daily.[10] This quantity, which is supplied by about 300 c.c. good breast milk, would require about 3,000 c.c.,[11] or 5 pints of raw milk, assuming this to be the only source of Vitamin C. Since this deficiency can be met by the addition of 1 oz. of orange juice to the diet, and since this is the only serious effect of pasteurisation, any statement that pasteurised milk is less nutritive than raw milk is erroneous.

Savage[12] states "there are no human experiments which demonstrate that pasteurised milk is less nutritive to the young child than raw milk, whilst there is a vast mass of clinical experience to show that heated milk has been consumed for years by young infants and children without any detectable deterioration in their nutritive condition," whilst Ogilvie and Peden[13] have shown that the *digestion of milk is not adversely affected by boiling.*

Need for a Close Watch on Pasteurising Plants

Adam[14] has drawn attention to the fact that what is called "pasteurised" milk is not always safe, and quotes an example in which an authority who had taken a combined sample from seven farms, on examination after pasteurisation, found it to contain live tubercle. This does not in any way, however, diminish the value of "efficient" pasteurisation; it simply stresses the necessity for seeing that this process is *efficiently* carried out.

Whilst it is quite true that under certain conditions a small proportion of tubercle bacilli may escape actual destruction, their virulence is so impaired as to make them harmless. Certain strains of streptococci may also survive, but these are not believed to be responsible for septic sore throat.[8] Whilst many retailers take all possible precautions, some do not, and thus tend to bring the process into disrepute.

In a clean milk competition organised last year by the Holland (Lincs) County Council only 15 out of 80 retailers of milk were sufficiently interested to enter,[15] and attention was drawn to the fact that, if the accredited scheme produces a similar result on a voluntary basis, then no one, least of all the milk producers, can be surprised if, in the public interest, a compulsory standard of cleanliness is introduced. Thousands of gallons of milk supplied to the public in this country would prove upon examination to be more grossly polluted than waters in shallow wells.

So far as the efficiency of pasteurisation is concerned, this can be ensured by the use of temperature regulators, recorders, and time charts, which would be open to frequent inspection, and by the use of chemical tests. The phosphatase test (Kay and Graham[16]) depends upon the detection of the enzyme phosphatase, which is always present in raw milk, but is destroyed at the temperature necessary for efficient pasteurisation. In this test the milk is incubated with disodium-phenyl-phosphate, when in the presence of phosphatase, free phenol is liberated which may be determined colorimetrically. Their examination by this test of a number of samples of pasteurised milks, supplied under the "Milk in Schools" scheme, showed that about one-quarter of the designated, and one-half of the schoolchildren's, milk was either raw or improperly pasteurised.

In this connection Schnetka[17] has found that it is possible to ascertain beyond doubt whether a milk has been properly pasteurised by a procedure based upon the fact that the readily coagulable portion of the lactalbumin in ammoniacal milk is precipitated more readily by ammonium sulphate than in neutral or acid milk, to an extent dependent on the temperature and duration of heating. Thus there should now be no difficulty in keeping a careful watch on the efficiency of commercial pasteurising plants, and that objection disappears.

Summary

It has been shown that numerous infections are conveyed by milk, amongst which tuberculosis and abortus are arousing particular attention. These organisms are, to all practical intent, destroyed by efficient pasteurisation, together with numerous others.

There is no diminution in the nutritive value of milk, and from a practical standpoint the positive advantages of pasteurisation by far outweigh any hypothetical considerations. Further, it is now possible to control the efficiency of the process by chemical tests.

In conclusion, it is hardly surprising to note that the consumption of milk in this country is very low compared with what it could be and should be. This, it is agreed by all, is most unfortunate, as milk is a necessary health-giving food with an actual nutritive value that is out of all proportion to its low cost. It is to be hoped that by improving the condition of our supplies the consumption of milk per head of the population will show a rapid improvement.

(*The Bibliography will be found on page* 189.)

SOME IMPORTANT ASPECTS of MEAT CANNING

By T. Crosbie-Walsh, F.I.C.

PART II

The Use of Nitrite

A SERIES of articles on meat canning would not be complete without some reference to the use of nitrite. A protracted discussion would be superfluous at the present time, in view of the many articles and letters which have appeared in journals during the past three or four years.

The matter, from a legal standpoint, stands as it did before. The undoubted confusion which has arisen is due to its supposed preservative properties. There is just one point which may be raised before leaving the subject. It has often been stated, both verbally and in writings, that nitrite is "ten times as strong" as saltpetre. This is rather a vague guide and might prove rather a dangerous one under certain conditions. The amount of saltpetre to be added to a pickle is such as will produce, under the special conditions obtaining during the pickling process, a convenient amount of nitrite by bacterial action. The amount of nitrite to aim at is that which will leave a maximum of about 0·5 parts per 1,000 in the pickle, after the pickling process is complete. According to the length of pickling, temperature, and other facts, the same amount of saltpetre may produce widely different amounts of nitrite. Saltpetre has no "strength" of its own. Hence the amount of saltpetre to be used will depend upon the circumstances favourable to its conversion into nitrite. A new pickle, contained in perfectly clean vats and with meat which has been handled hygienically, will begin to show signs of the presence of nitrite in about 5 hours at ordinary temperature.

The appearance of nitrite may be hastened by a "starter" consisting of some old pickle from a previous operation, which usually contains an active culture of denitrifying organisms. These get to work on the saltpetre at once; but if the pickling process is to be a long one this is unnecessary, and, if a short one, it is of little use. Moreover, there is a danger of passing over a culture of undesirable organisms. If the canner is confronted with the necessity of carrying out a short cure and wishes to retain his respect for existing regulations, he might melt his saltpetre in an iron pot and sprinkle a little sugar or flour on it. A part of the saltpetre will thus be converted into nitrite, and when put into pickle will ensure an almost immediate coloration of the meat.

Sugar in Pickles

The use of sugar in pickles seems to have come down from the very early days of meat preservation. Its object was probably to mask the extreme saltiness of the cured meat. It has been found by experiment that when sugar is added directly to the can of meat, prior to sterilisation, it is only when sugar is present to the extent of 1·2 per cent. that its taste can be detected. When sugar is added to a pickle there is rarely 0·15 per cent. of sugar to be found in the resulting pack. The author has never been able to detect any difference in taste arising from the addition of the usual amount of sugar added to pickle. A great part of the sugar is inverted during the pickling process, and the acidity of the pickle is somewhat higher than when sugar is absent. Slight traces of alcohol are found, and a feeble growth of wild yeasts noted. If this sugary used pickle is left for 24 hours at about 30° C., the yeasts multiply, and alcoholic fermentation followed by acetic fermentation set in rapidly.

There are indications that invert sugar has an inhibiting effect upon the growth of putrefactive micro-organisms and others. The use of sugar should be viewed as a means of inhibiting undesirable micro-organisms rather than conferring a taste to the product. With modern methods this should not be necessary. Addition of sugar in the can, either solid or in solution, appears to exert a binding effect, which is very useful when relatively small pieces of meat are being packed together. It is also useful in packs of tongue.

Brine Testing

Before leaving the subject of pickling, a brief mention of "brinometers" or "salinometers" may be made. The ordinary books of conversion tables dealing with hydrometers give salinometers a wide berth. With this type of hydrometer, 0 degrees corresponds to pure water and 100 degrees to a saturated solution of salt. The readings between these extremes indicate the percentages of saturated solution in the solution being tested. It is a curious system requiring a calculation (however simple) to arrive at the percentage of salt in the solution. It is not readily convertible to degrees in other hydrometers by means of tables. Apparently the way it is used is to add salt gradually to water until the usual degree salinometer is reached. A more convenient hydrometer for controlling pickle is one which gives a direct reading of the percentage of salt in a solution, just as the Brix instrument gives the percentage of sugar.

"Cooking" the Meats

The "cooking" of meats is somewhat of a misnomer. The actual cooking takes place in the steriliser. A better term, which I believe is of American origin, is "parboiling", although this word meant "thoroughly boil" in previous times. The object of parboiling is to expel from the meat a certain proportion of its natural moisture, thus obtaining a firm pack. The aim of the canner should be to arrive at the point at which the meat has parted with sufficient moisture to ensure this, whilst avoiding undue softening due to actual cooking.

As the result of a long series of investigations, during which analytical data were carefully collated, it has been established that cooking in plain water causes more loss of valuable extractives than cooking in a weak solution of those extractives. The aim of the canner should be to conserve the extractives in the meat as much as possible, as they contribute very materially to the flavour of his products. What actually happens when pickled meat is cooked in water heated by open steam is shown by the following table. This holds for the particular weight of meat treated, but similar tables may readily be prepared for such things as tongues, briskets, etc., and enable the canner to work more exactly.

Pieces of meat weighing on an average 4 oz. each were cooked as described and the following results obtained:

SERIES 1.

Weight of Beef.	*Boiling.*	*Loss Per Cent. Beef.*
479 grm.	0 min.	—
387 ,,	5 ,,	19·2
344 ,,	10 ,,	29·18
310 ,,	15 ,,	35·28
290 ,,	20 ,,	39·46
280 ,,	25 ,,	41·54
275 ,,	30 ,,	42·59

SERIES 2.

Weight of Beef.	*Boiling.*	*Loss Per Cent. Beef.*
402 grm.	0 min.	—
325 ,,	5 ,,	19·75
282 ,,	10 ,,	30·75
257 ,,	15 ,,	36·54
247 ,,	20 ,,	39·01
239 ,,	25 ,,	40·98
235 ,,	30 ,,	41·97
233 ,,	35 ,,	42·46

It will be seen by the above that the maximum loss is arrived at after about 35 minutes, and any further cooking of the meat of the size used is useless and, in fact, detrimental due to overcooking and loss of collogen, etc.

The above experiments were conducted on lean meat, and it was desired to know what happens to the fat during cooking. Some rather surprising results were obtained. Pure fat was cut from the meat and subjected to the usual process of pickling and then cooked in the usual way. The following results were obtained:

Cooking.	*Weight of Fat.*
0 min.	1,170 grm.
10 ,,	1,139 ,,
15 ,,	1,115 ,,
20 ,,	1,115 ,,
25 ,,	1,106 ,,

The original weight of fat was 1,000 grm. During pickling it took up 179 grm. of moisture, or 17 per cent. increase, so that the weight of actual fat going into a pack is more than its original raw weight. From the above table it will be seen that the weight of fat becomes constant at 15 minutes, the slight extra loss between 20 and 25 minutes being due to melted fat. Consideration of this data should be useful to guide the canner in cooking lean and fat meats. Similar data may be readily collated in the factory, the only requisite being an accurate weighing machine.

Conserving Extractions

The conservation of extractives has been mentioned above, and a very useful way of investigating the degree of extraction of the soluble constituents of meats is by the analysis of the total creatine and creatinine in the meat, pickle, and parboiling liquors. The extraction of the easily determinable creatine and creatinine affords an indication of all other extractives, mineral and organic, which accompany them. In this way a balance of the extractives in the various products may be made, giving an indication of their exact distribution. Obviously such investigations require the intervention of a chemical laboratory, and even so would produce a lot of work if adopted as a routine measure. However, they were actually carried out daily on factory samples for a period of nine years, mainly as a check on the material in the liquors entering into other departments.

The cooking or parboiling of meat should be done by plunging it into hard-boiling liquor, not only because this enables the meat to retain more extractives than if it were placed in cold water and brought to the boil, but also because the time of cooking can be more readily controlled. The meat should be weighed and the amount of liquor should be the same for each batch. The volume of liquor should be kept as low as possible, compatible with relative ease in stirring. Constant stirring during cooking is important, in order to obtain even cooking. Meat tends to "cake", and if not stirred energetically some of the pieces, or tongues or what-not, will be undercooked and the rather frequent fault of sloppy packs produced.

This stirring is an extra job produced by the reduction of the volume of cooking liquor. It is obviously not so necessary when the meat floats in little islets in a perfect ocean of liquor, being depleted of its valuable extractives. The best way of cooking is by open steam; that is, in tanks with open steam coils at the bottom. For the meat factory it is better to exorcise the ghosts of the jam factory. Those special-shaped jacketed pans are excellent for jam making. The only possible disadvantage of open steam cooking is the possible presence of boiler compound and oil. Experience has shown that such traces as do actually come over with the steam may be utterly ignored. At any rate, the steam can be cleaned by being passed through a separator.

The advantages of the system are several. Cooking time may be strictly standardised. The liquor in the vats is almost of the same composition throughout, whereas in jacketed pans evaporation is proceeding all the time and, if the liquor is used more than once, it is getting saltier and saltier. This does not occur in open steam cooking vessels. The level of the liquor is so arranged that, on introducing the basket of meat, it just reaches an effluent pipe. Thus, whilst the salt is being boiled out of the meat, the condensed steam dilutes the liquor again and the excess amount is carried away. The liquor may be kept from day to day, thus obviating the necessity of starting work with plain water. The cost of the cooking plant is much less, as ordinary iron tanks may be used, which are readily fitted with perforated steam-pipes.

As a result of some fifty analyses taken at random from a series made over a period of five years, the following maximum and minimum figures for the composition of the cooking liquor taken during cooking are given below:

	Maximum Per Cent.	*Minimum Per Cent.*
Total solids less salt ...	2·29	2·09
Salt (sodium chloride) ...	4·32	4·14
Total creatinine and creatine	0·14	0·11

Open steam cooking tends towards the better standardisation of factory methods, and the result of its proper use will be the avoidance of those nasty little shocks which sometimes occur in the tasting department of a cannery when abnormally salty products (or the reverse) are suddenly encountered. Meat, after cooking, should be put into cans as soon as possible. If left to grow cold, it gives a less adhesive pack despite the fact that it will ultimately be heated to a high temperature. If left on the tables it will also lose moisture, and it is of little use carefully to conduct the preceding operations to obtain a standard product and then allow it to lose varying proportions on the tables!

PECTIN AS CURDLING AGENT FOR MILK

WE hear that an interesting use of pectin, as a curdling agent for milk, has been developed in Germany. The curdling effect of pectin is remarkable and the resulting curd is said to contain all the substances present in the original milk.

NEW CANADIAN STANDARDS FOR EDIBLE GELATINE

THE new standards state that edible gelatine should contain not less than 82 per cent. ash-free solids and not more than 2·6 per cent. ash (calculated on the anhydrous material). Bacteria must not exceed 10,000 per gm.

THE COMMON HERRING

OWING to shortage of space in this Jam and Fruit Products number, we have been obliged to hold over the third and concluding part of "The Common Herring," by Elliot B. Dewberry, M.R.I.P.H., M.R.San.I., until next month.

THE PACKING OF NATURAL CHEESE IN CANS—ERRATUM

WE wish to draw attention to the fact that the patent number of the valved can described in pages 128-129 of our April issue is 414,284, and not as previously stated.

INFORMATION and ADVICE

Marmalade—Vegetable Sandwich Spread—Glacé Cherries—SO_2 and Dried Fruits—Ginger Marmalade—Jelly-Maker's Test—Piccalilli Manufacture

Marmalade

2,005. *We are at the moment busy making our year's supply of marmalade. We find that an occasional batch tends to rise—*i.e., *the peel gets to the top of the jar and the jelly to the bottom.*

We make in open pans, about 14 lb. to a batch.

Can you please tell me what the reason for this phenomenon is, and what is the antidote? (Kent.)

It is very difficult to say where the fault occurs. If you could give us particulars of your recipe and the method you use we might be able to assist.

The following is a typical recipe for an orange marmalade, which, we have been given to understand, is of good quality.

Take 2½ cwt. of oranges and 5 cwt. of sugar. The oranges should be cut into half and peeled. The peel is chopped very finely and boiled until tender. The inside of the oranges should be boiled in 10 gal. of water until the pips are loosened, passed through a wire sieve (6 holes to the inch) and placed in a 40-gal. tub, add the peel, stir well, and make to 40 gal. in all with boiling water. Then put in a steam pan—

Water	1½ gal.
Sugar	56 lb.
Pulp (ex the 40-gal. tub) ..	3 gal.

Stir well and gently bring to the boil, and then bring to 222° F. Pour into a hand-pan and fill.

Vegetable Sandwich Spread

2,006. *I should be greatly obliged if you would give me a formula for a vegetable sandwich spread.* (Bristol.)

The following is a typical formula for a Tomato and Onion Spread which will serve as a basis for experiments:

Tomato and Onion Spread.

Fresh tomatoes	40 lb.
Raw onions	10 ,,
White sugar	5 ,,
Salt	3 ,,
Cayenne pepper	¼ oz.

Put the tomatoes first in boiling water and then in cold water.

Place on a draining table and skin by hand. Pass through an 8-mesh sieve into steam pan.

Peel and cut up onions. Pass through a fine mincing machine, and add to the tomatoes in the steam pan. Add the other ingredients, stirring well, and bring gently to the boil. Fill at not less than 180° F.

Glacé Cherries

2,007. *We should be glad to have particulars of the correct procedure adopted for clarifying the syrups of colouring matter, as one of our clients interested in the manufacture of Glacé Cherries informs us that the syrups become dyed with the colouring matter during processing, necessitating the use of a fresh syrup for each batch of cherries.* ' (London.)

We have been informed that it is customary to continue using these syrups, as the colour remaining after a batch has been completed should not have any adverse effect when the syrup is diluted to start off a fresh batch. It is, of course, desirable to skim off any scum that forms between each boiling. After repeated boilings there is a tendency for discoloration, and this can be removed by adding about 2 per cent. of decolourising carbon, mixing well for some time and then filtering the warm syrup, say, at 120° F. through a press. It does not appear necessary to use a fresh syrup every time a batch of cherries has to be treated, as, providing that an excess of colouring matter is not added initially, the remaining final quantity is not large, owing to it being continually absorbed by the cherries themselves.

SO_2 and Dried Fruits

2,008. *We should be glad if you could tell us how and in what form Sulphur Dioxide is used for treating dried fruits.* (London.)

We have been informed that fruits which are commonly dried, such as apples, apricots, peaches, and other light-coloured fruits, are sulphured prior to drying. Such fruits as prunes, figs, and most raisins are not sulphured. Sulphuring is always done by SO_2 gas—usually by exposing the fruit to the fumes of burning sulphur in a suitable chamber, but sometimes by using cylinders of compressed gas to get the SO_2 in the chamber.

SO_2 facilitates the drying process, whether this be sun-drying or evaporation in a factory. Also the natural colour of the fruit is fixed and darkening due to enzymic action is prevented. The final product is more resistant to attack from insects and moulds than unsulphured fruit. In addition SO_2 to the extent of 500 p.p.m. exerts a preservative action on the vitamins. In this country, we understand, 2,000 p.p.m. is allowed, except for raisins, where the amount is 750 p.p.m.

The process is as follows:

The fresh fruit should be sulphured as soon as possible after picking. It is first sorted for blemished fruit, and then prepared by peeling, slicing, or cutting into halves, according to the type of fruit being dealt with. The pre-

pared fruit is then packed into trays, which are loaded on to trucks. The trucks are then pushed into the sulphuring chamber, which consists essentially of a concrete, brick, or wooden chamber suitably ventilated. Sulphur is ignited in a small pit at the back of the chamber, 6 to 8 lb. being used for each ton of fruit. The vents should be opened to allow the entrance of sufficient oxygen to support the combustion. After about 30 minutes, or less, the vents are closed and the sulphur is thereby extinguished.

Drying is then carried out in the usual way either by sun-drying or by evaporation.

Ginger Marmalade

2,009. *We shall be glad if you will furnish us with a recipe for good quality Ginger Marmalade.* (Wisbech.)

The following is a typical formula for this class of product and will serve as a base for your experiments:

Preserved ginger	40 lb.
Liquid pectin	6 ,,
White sugar	60 ,,
Soluble essences of ginger	1 dr.

Place the ginger in a steam pan with 4 gal. of water. Simmer for 15 to 20 minutes and then drain into a tub. Chop up the ginger into a very fine condition, pass the water through a filter, and return to a steam pan. Add to the steam pan the sugar and chopped ginger. Stir well, turn on steam, and bring temperature to 221° F. Add the pectin and afterwards the essences and stir well. Boil until 222½° F. Pour into dry hand pan and allow to cool to about 200° F. See that the ginger does not float to the top. Fill into containers and allow to cool before capping.

Jelly-Maker's Test

2,010. *Would you please tell us what the jelly-maker's test is and how it is applied?* (Bischofszell.)

A test for the jelly strength of gelatines is presumably referred to. If this is the case, you are no doubt aware that the British Standards Institution are bringing out a series of standard tests for gelatine. If you are referring to fruit jellies, then we do not know what you mean.

You are probably aware that the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery, and Jam Trades developed an apparatus for testing the strength of jellies. This apparatus is sold under the name of the B.A.R. Jelly Tester, and is suitable for testing either gelatine, fruit, or starch jellies of relatively low rigidity. It is not intended for use with very stiff jellies.

Piccalilli Manufacture

2,011. *We are interested in the manufacture of Piccalilli, and would be pleased if you could furnish us with a recipe.* (London.)

The following typical recipe, which is taken from the article on Piccalilli Manufacture in June, 1932, issue, will serve as a base for experiments.

PICCALILLI LIQUOR

16 gr. vinegar	48 gal.
Best mustard	36 lb.
Gum tragacanth	6 ,,
Turmeric	3½ ,,
Curry powder	1 ,,
Ground ginger	1 ,,
Table salt	7 ,,
Fine chopped shallots	4 ,,
Fine chopped garlic	1½ ,,
Granulated sugar	20 ,,

Place 6 lb. of gum tragacanth in 12 gal. of 16-grain vinegar and allow to stand for 24 hours, stirring up two or three times. Now put the rest of the vinegar in an enamelled pan; rub the gum into it through the sieve. Next add the sugar, salt, garlic, and the shallots, and stir well. Then add the spices, turmeric, and mustard through a fine sieve, and gently bring to the boil, simmering for 15 minutes. Pass the whole through a sieve into a tub, and allow to stand until cold; after which, stir.

VEGETABLES FOR BEST PICCALILLI

Cauliflower	1 cask
Bastards	¼ ,,
Chumps	⅛ ,,
Beans	1/12 ,,
Gherkins	1/10 ,,
West Indian pickle	1 gal.
Garlic, very fine	1 ,,
Mangoes, very fine	1 ,,
Pickled lemons	1 ,,
No. 0 silver skin onions	⅛ cask

Mix well together before putting into acetic acid and water. Do not cut the onions.

THE PASTEURISATION OF MILK

(Continued from page 185.)

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[4] *Jour. Amer. Veterinary Med. Assoc.*, vol. 86, March, 1935, 342-7.
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[11] *Ztshr. Untersuch. Lebensmittl*, 1935, 69, 306-313.
[12] *Lancet*, 1933, 429, 485.
[13] *Lancet*, 1934, 78.
[14] *Food Industries Weekly*, November 15, 1935, 6.
[15] *The Medical Officer*, December 28, 1935, 268.
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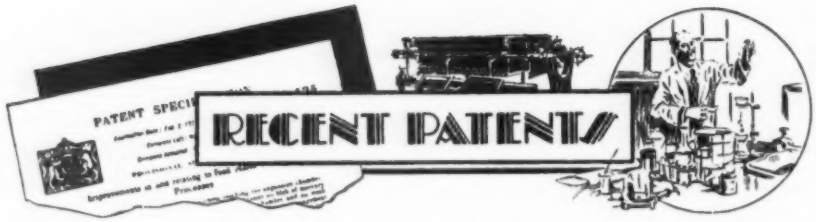
[17] Abstract, *The Analyst*, 1935, vol. 60, 712, 478.



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Latest Patent Applications

6994. PELKMAN BROS., LTD., and PELKMAN, J. H. N.: Treatment of dough. March 9.
6995. HUTCHEON, J., MAGUIRE, J. H.: Production of food. March 9.
7257. DANTZIG, A. VAN: Production of food. March 10.
7534. MUNTON, H. M. BAKER-: Cereal, etc., extracts. March 12.
7840. ELION, E., ELION, L.: Baking-salts. March 16.
7909. KOENIGER, W.: Apparatus for drying potatoes, etc. March 16.
8090. OXLEY, J.: Sorting-table for fruit, etc. March 18.
8594. STANDARD BRANDS, INC.: Process for inhibition of mould growth. March 23. (United States, April 11, 1935.)
9092. GOWLAND, J. P.: Containers for jam, etc. March 27.
9319. ALLEN, H. E.: Production of protein food colour. March 30.
9384. BUCHTING, A.: Production of pectin extracts. March 30.
9569. DOYLE, J. D., and DOYLE, M. K.: Means for testing, etc., eggs, etc. April 1.

Complete Specifications Accepted

443,572. HANACK, B., and HAACK, B.: Production of leaven and leavened dough.
443,662. ROGERS, F. H. (SPRECKELS SUGAR CO.): Method and apparatus for recovering sugar.
443,705. ROYAL BAKING POWDER CO.: Acid calcium lactates and method of preparing same.
443,716. BIRNIE, F. R.: Method of storing and/or preserving fruit and vegetables. (Cognate application 24032/35.)
443,911. CALIFORNIA FRUIT GROWERS' EXCHANGE: Food preservative means.
443,922. CALIFORNIA FRUIT GROWERS' EXCHANGE: Metal foil product and process of making the same.
444,146. GIBBONS, J. S.: Devices for feeding fruit and the like to grading machines.
444,258. GADSBY, F.: Containers for milk and other substances.
444,337. SOMMERMEYER, A.: Process of and apparatus for rendering fish, fish refuse, and the like.
444,534. PLATTE, J. A., and VRIES, G. H. DE: Processes for continuously crystallising sugar solutions.
444,658. NAYLOR, W. H., and DAY AND SONS, LTD., J.: Apparatus for packing powders and other goods in paper or other similar wrappers.

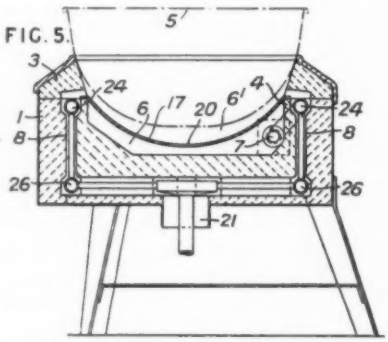
Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

438,519. GROUP XII. **Boiling-pan furnaces.** SOUTH METROPOLITAN GAS CO., CHANDLER, D., and SKINNER, A. J., 709, Old Kent Road, London.
Heating apparatus suitable for boiling sugar and other foodstuffs comprises a combustion chamber divided into upper and lower portions 6^1, 6, by a protective shield 17 of heat-resistant material and low thermal capacity, and a gas burner 7 is placed in the lower portion, from which products of combustion pass through a central or peripheral discharge into the

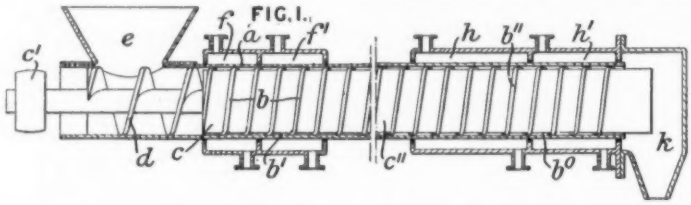
FIG. 5.



upper portion, above which the pan 5 is removably supported. The combustion chamber is enclosed in a casing 1 of refractory material, on the wall 4 of which is a ledge supporting the steel shield 17. Combustion gases escape through a central aperture 20 in the shield or through notches on the ledge. The combustion chamber is circular in plan and has a dome-shaped bottom and a tangential orifice for a burner 7, which raises the thin refractory shield 17 to incandescence. Combustion gases pass into an annular discharge channel 8, in which are placed upper and lower inter-connected pipe rings 24, 26, in which air and gas or other fuel are preheated. Combustion gases pass to a circumferential or central flue outlet 21. The rim 3 of the casing is removable.

439,746. GROUP I. **Cheese.** RAW PRODUCTS, LTD., 31, Basinghall Street, London, and DUTTWEILER, B., 5, Rue du Midi, Vevey, Switzerland.
In processing and pasteurising cheese the raw cheese is reduced—*e.g.*, by grinding in a roller mill—to a pasty consistency and then forced successively through a series of jacketed shallow helical paths b^1, b^0 constituted by a rotatable cylindrical

FIG. 1.



body or bodies c, c^{11}, each having a peripheral helical rib b, b^{11} and fitting truly in jacketed portions of a tubular member or members a, the cheese passing through in a thin layer and being expeditiously heated by the jackets f, f^1, h, h^1 to effect uniform pasteurisation without disintegration and fat separation. The cheese is supplied through a hopper e to a rotating screw d, which feeds it through the apparatus, which it leaves through a hopper k. As shown, one cylindrical body c, c^{11} is employed, and is actuated together with a screw d by a pulley c^1. Two tubular members each containing a cylindrical body and joined by a **U**-shaped tube may be used. Examples are given of the dimensions of the apparatus and the speed at which the cylindrical bodies are rotated, and the temperature of the heating medium may be 97° to 98° C. or 108° to 110° C. The emulsifying agent may be added to the cheese in reduced amount, or may be dispensed with; in the latter case a larger quantity of water than is normally used may be added to the cheese. Flavouring matter—*e.g.*, citric acid or salt, or both—and the emulsifying agents may be added to the water used.

439,952. GROUP XIII. **Withering tea.** MAIN, J. A., Vincent House, Vincent Square, Westminster.
In a method of withering tea in a loft, air is circulated through the loft, and its hygrometric state at entry is controlled to maintain as nearly as possible a predetermined ability to take up moisture at a point reached after passing the whole or a predetermined portion of the leaf in the loft, the arrangement being such that, if the air supplied in the moistest of three or more alternative conditions gives a moisture-absorbing capacity below that predetermined at the point in question, a correction is applied causing drier but not substantially warmer air to be admitted, and if after this correction has been applied the moisture-absorbing capacity is

still below that predetermined at the point in question, a correction of a different kind is applied, still causing the air admitted to be drier, whether or not it is warmer. In the arrangement shown in Fig. 1 a hygrometer 1 is situated at the entrance to a duct 2, through which air issues from a withering loft 3. The duct is formed with a branch 4 divided into two parts 5, 6. A damper 7 is normally maintained in the position shown so that air may issue from the loft through the outlet 5 and fresh air be drawn in through inlet 6 and ducts 10, 9. The duct 10 is provided with a damper 12, normally vertical. The dampers 7, 12 are adapted to be controlled by devices 8, 14, each containing a relay-controlled solenoid which, when energised, moves the associated damper to a position at right angles to its normal position. When the air in the loft is too dry the hygrometer needle 15 touches a contact 18, thereby completing a circuit to operate the device 8 so that the damper 7 is moved to the position 7^1. The air in the loft is thus caused to be re-circulated, passing through ducts 2, 10, 9. When the moisture from

FIG. 1.

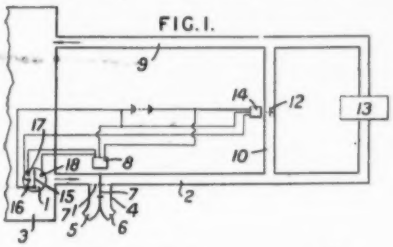
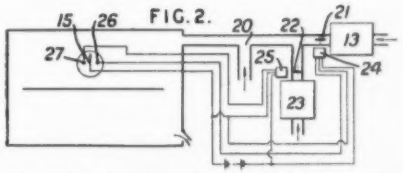


FIG. 2.



the leaf raises the humidity of the air the needle 15 leaves contact 18 so that the damper 7 returns to its normal position. If the air in the loft is too humid, the needle 15 engages contacts 16, 17, whereby both dampers 7, 12 are operated, so that air issuing from the loft passes through a drying plant 13 before being returned to the loft. In the arrangement shown in Fig 2 fresh air is used all the time. The hygrometer 1 is situated in the loft, where the humidity of the air is likely to be fairly constant, and the direction of circulation of the air through the loft is periodically reversed. Fresh air enters the loft through inlet 20, and may be mixed with dried air by opening a damper 21 associated with a drying plant 13, or with heated air by opening a damper 22 associated with a heater 23. The dampers 21, 22 are controlled respectively by devices 24, 25, which are electrically operated, as in the arrangement shown in Fig. 1. When the air in the loft is too dry the hygrometer needle 15 touches contact 26, whereby the device 24 is operated to close damper 21 and prevent admission of dry air. If the air is too humid the needle 15 touches contact 27, whereby the device 25 is operated to open the damper 22 and allow hot air to enter the loft.

LATEST TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

BIOPHASE.—566,165. **Malt extract (for food).** MUNTONA, LTD., Muntona Works, 73, Midland Road, Bedford. April 8.

BREAK-O-DAY.—564,040. **Fresh fruit and fresh vegetables (for food).**

'Break-o-Day'

ROBERT WALKER, HENRY WALKER and ROBERT KENNETH WALKER, trading as R. Walker and Sons, Duncalf Farm, Clay Lane, Ringway, Cheshire. March 25. (By Consent.)

CANVILLE.—566,473. **Preserved meats and preserved fish.** EAST ANGLIAN PRESERVING CO., LTD., 1, York Row, Wisbech, Cambridgeshire. March 25. (Associated.)

GEORGE KEMP.—566,808. **Biscuits being wholly or partially coated with chocolate.**

George Kemp

CHOC-O-LAIT

GEORGE KEMP, LTD., North Circular Road, Cricklewood, London, N.W. 2. April 8. (Associated.)

Registration of this trade mark shall give no right to the exclusive use of the word "Choc-o-Lait".

HOLIDAY.—566,636. **Substances used as food or as ingredients in food, but not including chocolate or chocolate biscuits, and not including any goods of a like kind to chocolate or chocolate biscuits.**

MORRIS AND JONES, LTD., 82 to 86, Whitechapel, Liverpool. April 8. (Associated.)

Registration of this trade mark shall give no right to the exclusive use of the device of ears of corn.

IMP.—559,888. **An improver for brown bread.** SCOTTISH CO-OPERATIVE WHOLESALE SOCIETY, LTD., 95, Morrison Street, Glasgow, C. 5. April 1.

JOLLY BOY. — 566,443. **Sauces and pickles.** GEORGE MASON AND CO., LTD., Chelsea Works, 265, Merton Road, Southfields, London, S.W. 18. March 18.

Sauces and pickles and goods of a like kind will be struck out from the goods of Registration No. 383,102 (2102) if and before the applicants' mark is registered.

JOYO.—564,952. **Margarine and edible fats.** ANGLO DAIRIES AND CANNERS, LTD., 135, Tooley Street, London, S.E. 1. March 18.

LION.—561,996. **Seasoning, pepper, spice, nutmeg, ginger, colourings, rusks, herbs, salt, farina, rice, and gelatine, all for use as food or as ingredients in food.**

HERBERT AND SONS, LTD., 6 and 7, West Smithfield, London, E.C. 1. April 1.

SEALDHEART.—561,472. **Canned fruits.**

FLORIDAGOLD CITRUS CORPORATION, Corner of Lee-Johnson Highway and Glencruitten Avenue, Lake Alfred, Polk County, Florida, United States of America. March 18. (By Consent.)

TAS.—564,565. **Fresh and preserved fruit.**

TOMAS ALCAZAR SANCHEZ, Calle Algeziras, Beniajam (Murcia), Spain. March 4.

Registration of this trade mark shall give no right to the exclusive use of the devices of fruit.

TELMA.—564,212. **Tea.** JACOB RICHMAN, 35, Kyverdale Road, London, N. 16. March 4.

TRIDENT.—566,602. **Substances used as food or as ingredients in food, but not including flour and not including any goods of a like kind to flour.**

MACONOCHIE BROTHERS, LTD., Maconochie's Wharf, West Ferry Road, Millwall, London, E. 14. (Associated.)

TRIDENT.—566,603. **Substances used as food or as ingredients in food, but not including flour and not including any goods of a like kind to flour.**

MACONOCHIE BROTHERS, LTD., Maconochie's Wharf, West Ferry Road, Millwall, London, E. 14. April 8. (Associated.)

NEW COMPANIES

Anderson, Richards and Company, Limited. To take over the canned goods department of the bus. cd. on by Jeavons, Tinto and Co., Ltd., at 41, Eastcheap, E.C. Nom. Cap.: £10,000. Dirs.: D. A. Anderson, Solness, Thornfield Avenue, N.W. 7; D. Richards, Mount Royal, Londonderry, Northern Ireland; and D. C. Jeavons, 59, Wynnstay Gardens, Kensington, W. 8.

Babbage and Sons, Limited. To take over the bus. of butchers cd. on at 36, Cotham Hill, and 55, East Street, Bedminster, Bristol, as "Babbage and Sons"; at 18, Cotham Hill, as "The Cotham Meat Supply"; and at 5, Byron Place, Clifton, Bristol, as "Lane and Co." Nom. Cap.: £10,000. Dirs.: G. G. Babbage, 36, Cotham Hill, Bristol (permt. mng. dir.); Mary A. Babbage, Wick House, Elmlea Avenue, Stoke Bishop, Bristol; W. N. Pope, 17, Berkeley Road, Westbury Park, Bristol.

Battey (Butchers), Limited. Capel House, 54, New Broad Street, E.C. To carry on the bus. of wholesalers and retailers of meat, etc. Nom. Cap.: £1,000. Dirs.: T. C. Battey, 1, Parsonage Gardens, Enfield; R. C. Barker, 1, Parsonage Gardens, Enfield; L. H. Graves, Ailsa Craig, Vera Avenue, Grange Park, N.

Henry Bowdler, Limited. 45, All Saints Road, Wolverhampton. To take over the bus. of a wholesale and mnfg. confectioner cd. on at Wolverhampton by H. Bowdler. Nom. Cap.: £2,500. Dirs.: H. Bowdler and Mrs. K. H. Bowdler, both of 219, Tettenhall Road, Wolverhampton.

Bradley's Shredded Beef Suet Company, Limited. 9, All Saints Road, King's Heath, Birmingham. To carry on the bus. of mnfrs. and dlrs. in shredded suets, etc. Nom. Cap.: £2,000. Permt. dirs.: P. Bradley, 308, Ladypool Road, Birmingham; P. A. Norman, 6, Merton Road, Moseley, Birmingham.

Butterworths (Manchester), Limited. 78, King Street, Manchester. To carry on the bus. of fruit and potato mchts., etc. Nom. Cap.: £5,000. Dirs.: To be appointed by the subs. Qual. of dirs.: 100 ordinary shares. Remun. of dirs.: As voted by the company. Subs.: H. Butterworth, 14, Burlington Avenue, Morecambe; H. Butterworth, jnr., 14, Burlington Avenue, Morecambe.

C. Carwardine and Company, Limited. To take over the bus. of millers and millers' sundriesmen cd. on at 12 to 16, Nicholay Road, Islington, N., as "C. Carwardine and Co." Nom. Cap.: £6,000. Dirs.: C. M. Carwardine, 62, Cecil Park, Church End, N. 8; T. E. Carwardine, 31, The Chine, Muswell Hill, N. 10; Cecily E. Wenham, address not stated; G. J. Wenham, address not stated.

Cestrian Mineral Water Works, Limited. To take over the bus. cd. on at Old Post Office Yard, Chester, as the "Cestrian Mineral Water Works". Nom. Cap.: £4,000. Dirs.: E. Lloyd, The Bungalow, Lache Park, Chester; and J. M. Lloyd, The Gables, Stocks Lane, Chester (mng. dir.). Both permt.

Cottage Candies, Limited. 15, Queen Street, E.C. 4. To carry on the bus. of mnfrs. of and dlrs. in confectionery, etc. Nom. Cap.: £1,500. Dirs.: J. Fripp, Southview, Great Boundes, Southborough, Tunbridge Wells; W. E. J. Kemm, Elmhurst, Grove Park, S.E. 5; and R. M. Butler, 161, Gleneldon Road, S.W. 16.

Gillott's Bakeries, Limited. To carry on the bus. of mnfrs. of and dlrs. in confectionery, bakers, etc. Permt. mng. dir. and ch.: C. W. Gillott, 98, Lyons Street, Sheffield. Subs.: L. F. Elverstone, Temple Chambers, Coalville, Leicester; C. L. Coleman, 14, Belvoir Road, Coalville.

Havmor, Limited. To take over the bus. cd. on at Westerhope, Northumberland, as the Havmor Co., and to carry on the bus. of mnfrs. of and dlrs. in farinaceous, meat, dairy, and other foods, etc. Nom. Cap.: £3,000. E. E. Wilkinson, of Lynden House, Westerhope, signs as director. Sub.: B. R. Wilkinson, Lynden House, Westerhope.

Honeybee Farmers, Limited. London Road, Marlborough. To carry on the bus. of mnfrs. of and dlrs. in honey, fruit, vegetables, jams, etc. Nom. Cap.: £100. Permt. dirs.: A. W. Gale, 104, High Street, Marlborough; and G. E. Havinden, 43, Cavendish Road, N.W. 6.

Insulated Appliances, Limited. Manor Works, Rowan Road, Streatham Vale, S.W. 16. To carry on the bus. of mnfrs. of and dlrs. in thermal appliances, porcelain and vitreous enamellers, etc. Nom. Cap.: £10,000. Dirs.: R. A. Fulford, 12, The Causeway, Sutton, Surrey; A. E. Leach, 20, Shirley Avenue, Cheam, Surrey; M. Payne, 50, Hook Road, Surbiton, Surrey.

Knock Fisheries, Limited. 8, St. Dunstan's Hill, E.C. 3. To carry on and turn to account the bus. of K. F., Ltd., and to carry on the bus. of fish mchts., etc. Nom. Cap.: £5,000. Dirs.: Viscount Massereene and Ferrard, Flat 10, 17, Berkeley Street, W. 1; Hon. J. T. F. Whyte-Melville Skeffington, Flat 10, 17, Berkeley Street, W. 1; Capt. C. R. Dewhirst, Chilvers Cottage, Alexandra Road, Watford, Herts.

Krema, Limited. 9, Bishopsgate, E.C. 2. To carry on the bus. of mnfrs. and importers of and dlrs. in milk and milk products, etc. Nom. Cap.: £100. Dirs.: H. C. Wood, The Ridge, Speldhurst, Kent; A. T. Laing, 27, Queen's Gate, S.W.; E. H. F. Anderberg, Odengatan 19, Stockholm; and G. M. Ahlen, Klippgatan 6, Stockholm.

Leamington Dairy Company, Limited. To carry on bus. as mnfrs. of and dlrs. in ice-cream, milk, butter, etc. Nom. Cap.: £300. Permt. dirs.: H. Whitehead (mng. dir.) and Mrs. H. A. Whitehead, both of 7, Russell Terrace, Leamington Spa.

Maltings Pig and Fruit Farm, Limited. The Maltings, Great Leighs, Essex. To take over the bus. cd. on at Great Leighs and Black Notley, Essex, as "Ethel Gertrude Malone", and to carry on the bus. of pig farmers, dlrs. in dairy and farm produce, etc. Nom. Cap.: £2,500. Dirs.: Ethel G. Malone, The Maltings, Great Leighs, Essex; A. Ash, 89, West Street, Carshalton, Surrey.

Metal Closures, Limited. To carry on the bus. of mnfrs. of and dlrs. in seals, caps, corks, and stoppers, etc. Nom. Cap.: £100,000. Dirs.: W. V. Esperson, Wood Corner, Pyrford, Surrey; J. Lied, 20, Pall Mall, S.W. 1; W. L. Beaven, A.M.I.M.E., 1, Barron Road, Northfield, Birmingham.

Midland Mustard Company, Limited. To carry on the bus. of mnfrs. of and dlrs. in mustard, sauces, pickles, etc. Nom. Cap.: £500. Dirs.: G. E. Havinden, 43, Cavendish Road, N.W. 6; and Lilian Hart, 22, Hamilton Terrace, Leamington Spa. Sub.: L. Millns, Nazing, Station Road, Amersham, Bucks.

G. W. Miller, Limited. 32, High Street, Whittlesey, near Peterborough. To take over the bus. of a baker and confectioner, corn and offal dealer, etc., cd. on at Cambridge by G. W. Miller. Nom. Cap.: £2,000. Permt. dirs.: G. W. Miller, Lily Miller, and J. E. Miller, all of 34, High Street, Whittlesey, near Peterborough.

J. Nielsen, Limited. Smallford Nursery, St. Albans, Herts. To carry on the bus. of raisers, growers, and sellers of fruit, corn, cereals, seeds, etc. Nom. Cap.: £24,000. Dirs.: To be appointed by the subs. Subs.: C. Russell, 137, Oakleigh Park Drive, Leigh-on-Sea; D. W. Cornforth, Uplands, Braiswick, Colchester.

Malcolm Norman, Limited. To carry on the bus. of mnfg., export, wholesale, and retail confectioners, etc. Nom. Cap.: £100. Life dirs.: H. N. Amphlett, 18, Stanhope Gardens, Highgate, N. 6; and Alice M. M. Macdonald, 30, Lyndhurst Avenue, Mill Hill, N.W. 7.

Northern (Mineral Waters), Limited. To take over the bus. of mineral water mnfrs. and bottlers cd. on at 131, Tudor Road, Cardiff, as the "Northern Bottling Company". Nom. Cap.: £6,500. Permt. dirs.: Mrs. G. Shoskanas, Hollywood, Kyle Crescent South, Whitchurch, Cardiff; Miss V. Nowall, Meredale, 6, Grasmere Avenue, Roath Park, Cardiff; H. Dickens, Yewdale, Celyn Grove, Cyn Coed, Cardiff; Emily Dickens, address not stated; Elsie Edwards, address not stated.

Pawlyn Brothers, Limited. To take over the bus. of wholesale and retail fish and ice mchts. cd. on at Plymouth, and at Mevagissey, Padstow, and Port Isaac, as "Pawlyn Bros." Nom. Cap.: £25,000. Dirs.: T. A. Pawlyn, 1, Glynn Road, Padstow (ch.); G. F. Pawlyn, Upcot, Thorn Park Road, Mannamead, Plymouth (vice-ch.); T. A. Pawlyn, Junr., Quarry Close, Mevagissey, Cornwall; N. D. Pawlyn, Stormont, Padstow; G. C. Pawlyn, 37, Mutley Road, Plymouth; R. Pawlyn, 1, Home Park Avenue, Mannamead, Plymouth; and R. Pawlyn, Windsmeet, Mevagissey. (Two first named are permt.) Sol.: Bernard H. Richardson, Market Place, Camelford, and at Wadebridge.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.